

Six Distinctive Contributions to the Debate on Musso's Thesis

Let us now summarize the six contributions to the discussion of Musso's theories of networks and retiology. Subtil and Mendonça analyses the technicizing impact of networks on the idea of communication and the influence of the network ideal on the current direction of technology in the service of power and economic advantage. Communication networks, in the Saint-Simonian ideal of the technical network, reduce the distances between classes and peoples, in that they involve people and society. The operation of democracy, itself inherent in and driven by networks, allows this process to take place, as a symbol and vehicle for democracy and equality. Subtil and Mendonça draw on the development of the media to illustrate how the information revolution made possible by networks has become the axis of a new capitalism, and stress the significance of three factors: the consolidation of nations with the introduction of the telegraph; the standardization and industrialization of news procedures and the institutionalization of the press as an engine of power and economic intervention.

With the computer and micro-computing, social life has expanded and knowledge have become disseminated, and the Saint-Simonian ideal of world networks has acquired concrete form in the new era of information. Subtil and Mendonça see this trend in Michel Chevalier. While pointing out that there is no straight line from the Saint-Simonian tradition of technical networks to the current shape of technology as an instrument for seeking power and profit, they demonstrate how the libertarian and liberal ideal present in Saint-Simonianism in the person of Chevalier enables (and advocates) information capitalism.

The irreducible nature of the relationship between technical and political networks is explained by the allusion to a technological utopianism of the Promethean type and by consumption. The utopian disposition is the representational aspect of network dynamics, reflecting the projection of an ideal and the search for its realization. In combining the imaginary and realization, involving individual persons in the attraction of their promises, the network lends itself to idolatry as a symbol of social change and acquires ideological content. The cult of networks and the technological sublime reflect the idea that technology is sufficient unto itself as a political goal.

David Fernández-Quijada's contribution also addresses the influence of the technical network as ideology in today's world. He argues that the modern doctrine of retiology was strengthened and intensified with the advent of the digital era and that, despite the dematerialization of networks, the physical is still very much present in the digital universe.

In the *ethos* associated with the Internet he perceives a materialization of Saint-Simonian utopianism, highlighting peer to peer networks in this context as free sharing communities based on the premise that all members contribute to the operation and maintenance of shared information flows. Fernández-Quijada argues that this model was not, however, created by the new media, nor does it produce

egalitarian outcomes, because digital networks themselves produce new hierarchies.

Another example of the way in which the determinism of retiological rhetoric has been reinforced is to be found in the liberalization of the broadcasting industry, with the aim of reusing its frequencies for profit-making mobile telecommunications services. Increasingly, with the changeover to digital television, commercial interests have been favoured over public service interests, and this illustrates the way in which digitalization has accentuated these problems and dynamics.

In connection with the second argument, Fernández-Quijada concurs with the territorial nature of networks, following Musso's suggestion that territory, in addition to its physical aspect, also has a cultural and political existence. He underlines the significance of physical space in the geographical grouping practices (clusters) of industrial firms and of industrial actors associated with production and distribution, and its impact on the geography and characteristics of regions in terms of customers and suppliers, infrastructure and natural and human resources, and low transaction costs as a result of the short distances involved. Rather than arguing that modern retiology can be traced to the earliest stages of the media, Fernández-Quijada demonstrates that retiological determinism is a mirror of capitalist dynamics, just as the threat hanging over public broadcasting companies is a derivative of the neoliberal ethos.

In his article, Steven Dorrestijn outlines the advantages of Musso's contribution, putting together an essay on the utopian, dystopian or ambivalent interpretations of technical mediation, while developing a dual critique of Musso's appropriation of the notions of "network" and "utopia". Dorrestijn sees the breadth of Musso's historical perspective as its principal merit, in that it gives him an analytical advantage when it comes to discussing the issues surrounding technology today. Dorrestijn goes on to explain the origins and meaning of the notion of utopianism and describes the historical development of ideas which link technology and its social worth.

With references to Francis Bacon and Jeremy Bentham, Dorrestijn demonstrates how utopian were Saint-Simon's plans, combining the utopian intentions of technocratic philanthropism with the aim of revolutionising religion. In identifying industry as the desired model for society, the Saint-Simonian project conveys that negative characteristic which Dorrestijn seems to stress as being central to the utopian conception of technology: the lack of critical ethical reflection.

Moving on from the utopian vision, Dorrestijn notes the advent of ethical concerns in relation to technology, before identifying a more recent and ambivalent notion: that technology, deprived of any essence, contains both positive and negative possibilities, so that the way it is implemented becomes significant, and adverse effects can be avoided or corrected. The third part of Dorrestijn's analysis is a critique of this idea. Musso seems to distinguish two sorts of techno-utopianism: one inspired by the Saint-Simon's social semi-utopia, which recognizes the importance of positive technology, and the other which identifies the technical network as the ideal organism, based on Saint-Simonian ideas. Dorrestijn believes that distinction should depend on the relationship between utopianism and social involvement.

If social and political participation depend on utopian inspiration, then perhaps some utopianism may be justified.

In conclusion, he analyses the centrality of the notion of networks in Musso's explanations of techno-utopianism, suggesting that its omnipresence does not necessarily imply acceptance of the techno-utopia. In this connection the work of Bruno Latour is revealing, in that it shows how immersion in the network does not mean abandoning an empirical stance towards concrete social issues. Dorrestijn favours an empirical orientation rather than one subordinated to "mental concepts" and, rather than being critical of Musso's thought, suggests alternatives in the form of a more empirical orientation.

Francisco Rüdiger is concerned with the relationship between retiology and capitalism, but does not limit his critique to this text of Musso's. Looking at other articles and works by Musso, he identifies an integrative and rational view of the idea of technological innovation, which he believes to be problematic and debatable. In Rüdiger's view, Musso argues that through better linkages between technological innovation policies and knowledge of the social imaginary, it would be possible (and desirable) to reconstruct the discourse of the network minimizing its ideological nature, preserving technical rationality and fulfilling consumer desires. Thus Musso not only recognizes the social function of retiology, but also rescues the reticular idea itself and puts forward a rational reworking of the network so that it will contribute to technological innovation. Keeping faith with autonomous reason as the principle which helps us to explain the real world and eventually plan new guidelines for it, Musso acknowledges the mediation of the symbolic and the imaginative on this world. His approach to innovation is an effort to combine older modernist expectations of a rationalization of the culture with the arbitrary nature of social actors' desires today.

According to Rüdiger, Musso's reflections reveal a loss of critical perspective and are covered by a layer of strategic and instrumental interest. He does not address the issue of the will to power which is intrinsic in the capitalist market economy and directs innovation into the channels necessary for greater economic advantage, nor does he investigate the very concept of innovation, and its implementation as a corporate policy at the turn of the twenty-first century.

Along these lines, Rüdiger questions, to a degree, the possibility of shaping the imaginary in an instrumental way, because it is actually the will to power which explains the search for innovations and their eventual adoption. Musso's abandonment of the critique of retiology shows how we are able to criticise Saint-Simonism without escaping the web of the will to power, which is evident in his aim of preparing the ground for the advent of industrial forms capable of shaping the social image of technology for profit-making purposes.

Rüdiger sees Musso as a new philosopher of innovation who, having once criticized retiology, succumbs to a similar ideology, granting academic legitimacy to those who see technological innovation as the key to social change and a replacement for political action. The parallel with Saint-Simonism is clear. The image of innovation is for Musso what the network was for the Saint-Simonians.

Dazhou Wang and Kaixi Wang, and Rodrigo Saturnino enrich the discussion on networks by comparing the ideology of the technical network and Saint-Simonian thought with recent or current political contexts and events. Reviewing how the Internet has penetrated and developed in China, Wang and Wang focus their analysis on how society and the Internet have developed side-by-side. These authors present the Internet as a laboratory, in which social, corporate and governmental actors operate in various ways and engage in power dynamics leading to social change. Wang and Wang highlight the presence of *e-influences*, dissident voices which have given rise to the diversity necessary for social change, allowing for public opinion to be formed among those surfing the Internet.

The right of association, which had been restricted in China, was achieved with the Internet, thanks in large part to Weibo, a microblogging service which encouraged political participation, and led the central government to outline strategies for dealing with the Internet, such as the dissemination of explanations of matters of public interest. This rendered politics more transparent by helping to explain those matters to the general public.

The government, however, fearing threats to social stability, set up the Great Firewall, a system of control and surveillance which blocks certain websites and filters keywords which web surfers key into search engines. Business entities, required to set up security systems to prevent the illegal transmission of information, carry out their own censorship so that web surfers, being aware of the censorship they are likely to suffer online, practice a kind of self-censorship.

In the light of the dynamics resulting from the spread of the web, these authors go along with Latour, who sees the Internet as a laboratory in which social actors, far from having defined and unchanging properties, experiment with its possibilities. With the emergence of personal media, civic participation has triggered mass mobilization in support of specific causes. This, combined with the increase in governmental transparency, contributes to greater freedom and to strengthening the rights to information and publication.

Wang and Wang suggest that there is not one "Internet", but several "internets". This goes against the idea of "universal association" and the conception of the Internet as an automatic conduit for democracy. The authors stress the dynamics of the interaction between the state, society and the Internet, in a process in which all those involved tested the suitability of different behaviours. Their main argument seems to be that social change is not a feature of networks and is not inherent in their architecture, but depends rather on political choices: they lack, in effect, a political framework which might encourage further exploration of their nature as a laboratory.

Rodrigo Saturnino analyses the emergence and ideology of the Pirate Party of Sweden, whose trajectory reflects the ambiguous nature of the Internet. The main aim of this party, which arose in response to technical and legal attacks on the free sharing of information, was to question the legitimacy of the private sector's drive to monopolize information and thereby restrict civic autonomy.

Its success to date lies in the adoption of a holistic strategy which caters to the needs of different cultural contexts, in line with the basic principles which rely on

the technological imaginary. Like Musso with the disciples of Saint-Simon, Saturnino identifies in the Pirate Party's trajectory a utopian inclination based on the reticular imaginary. But the pirates know that to achieve their reticular democratic imaginary they need to institutionalize the struggle and the resistance, by reiterating the libertarian and techno-utopian nature of the network as a democratic instrument. For the pirates, the rhizomatic nature of the network, which makes control and surveillance possible and provides the means for a new capitalism, also provides the guidelines for a new path of resistance.

Saturnino's contribution is also notable for the way he identifies which forms of network allow for polysemantic interpretations and shows how the uses of the Internet depend above all on their technical structure, even if they have their origins in the reticular ideology and imaginary. The fact that information circulating on the Internet has successfully been placed in the service of the market is a prime example of the polysemantics of technical networks and more specifically of the Internet. A second example of this ambiguity is to be found in the paradoxical relationship between the privatization of information and privacy, inasmuch as the logic of the privatization of knowledge has taken place alongside the adoption of policies which disregard users' privacy. The third example lies in the objectification of contradictory advantages: while on the one hand it encourages the circulation of information, on the other hand it lends itself to control and the institutionalizing of surveillance.

In this sense, because competition for power and the colliding interests of markets and citizens attach to the idea of information and because, in the Pirate Party's philosophy, information is a common good, not only "are we all connected", but "we are all pirates" also.

Pierre Musso himself offers a summary at the end of the book, in which he engages with each of the commentaries, examining the different meanings and symbolisms of networks, and looks at the metaphorical aspects and the models of rationality in which retiology prevails in a variety of spheres today.

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Chapter 2

Network Ideology: From Saint-Simonianism to the Internet

Pierre Musso

For the last two centuries, each “industrial revolution” in the West has been accompanied by and relied upon the formation of a large territorial technical network: the railways, with the first “industrial revolution” (1780–1830), the electrical network, with the second “industrial revolution” (1880–1930), and finally the Internet network, spawned by the convergence of telecommunication and information technology, with the third “industrial revolution” (since 1960). These major industrial complexes have been defined as “technical macro-systems”, for they combine technical networks with power structures (see Gras 1997).

The third industrial revolution, that of information technology and its encounter with telecommunications, has resulted in the generalized computerization of society and the economy, along with the development of the Internet, social networks and information systems, and virtual and digital simulation techniques. The contemporary “technical macro-system” is thus comprised of interconnected information, command and communication networks, interlinked with the transport and energy networks. Many myths, fictions, images and imaginaries¹ have always surrounded the development of major technical networks, with the purpose of socializing them.

A new divinity is tending to prevail today, a technician divinity, and the Internet is but one of its luminous apparitions: “the Network”. The figure of the network is becoming ubiquitous. Everything is a network, or even a “network of networks”. The organization of daily life becomes a constant use of networks, a quest for

All translations are mine, unless otherwise indicated.

¹We have translated the French “imaginaire” as “imaginary”, although the notion is more complex in French. The reader is referred to Gaston Bachelard’s philosophical definition.

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access or connection to electrical or electronic networks, communication and information networks, urban networks, transport networks, etc., and is fitted into their dense webs covering the entire planet. Commenting on the Network's omnipresence and omnipotence, whether to emphasize its benefits or its threats, has become somewhat trite. Cities become a "Networkopolis" or a "Smart City" resembling a large urban information system, while the Earth turns into a "relational planet". Manuel Castells sees a "network society" emerging and "social networks" are said to define human relations (Bressand and Distler 1986, 1995). The Network even provides interconnected subjects who are "switched-on" with an identity (through Facebook or Twitter). Manuel Castells explains that "our societies are increasingly structured around a bipolar opposition between the Net and the Self" (Castells 2010 [1996]: 3), while philosopher Pierre Legendre notes that "our societies are driven to networked feudalization" (Legendre 2001: 221). Hence, the Network gives meaning and direction. Its effectiveness is enhanced by its mythological foundations, which signal the future and social transition. Social change is now thought to be constantly experienced through connection, being "switched on", digital interaction and immersion in virtual flows and worlds. The technical network thus becomes the end and the means to think and perform social transformations and even present-day revolutions. Be it literary fiction, futurology or the decryption of the network society, the network imaginary is incessantly announcing the "revolution" of (and through) networks. Hence, the digital, Internet, robotic, industrial, and other "revolutions" that are "changing the world" thanks to Apple, Facebook, or Google.

The Network defines not only the new rules of the economy, but also those of power (see Rifkin 2000). At the same time, this constant cult of the Network which is re-enchanting daily life, particularly through the virtues of the Internet, enables us to reinterpret the contemporary world. For the Network has also become a process of reasoning enabling us to think about the world. The unbridled imaginary produced by the network is a product of its embeddedness in technologies; it provides a "techno-imaginary", or even a "techno-messianism", to use anthropologist Georges Balandier's term (2001: 20), and a mode of understanding of the world made all the more powerful by the omnipresence of techniques. The network is at one with techniques, as its entire history attests.

The Tree and the Network

The network is a dual figure. Like the State, with which it is often contrasted, it has the two faces of Janus: the one technical and the other technological, if we agree to consider technology (*tekhné* + *logos*) as a representation and a narrative of technique. The technique-network allows the neo-industrial world to function "efficiently" and the technology-network provides an account thereof. The network is an artefact to amplify action and accelerate movement; it inspires dreams and allows analysis: extraordinary virtues, like those of the tree until the Age of

Enlightenment. Provided by nature, the tree gave a point of reference, it signaled a hierarchical and genealogical order, as well as that of knowledge in the Encyclopedia: from the buried roots to the branches stretching up towards the sky, passing by way of the trunk, the tree distributed filiations and knowledge. The One (the trunk), stemming from the multiple (the roots), again begot the multiple (the ramifications). Through its verticality, the tree ensures the linear transition from the earth to the sky, from the experienced present to the promised beyond. The symbolism of the tree was in a sense “uprooted” during the Enlightenment, with the great overhaul seeking to “disenchant the world”. And the re-enchantment was swiftly achieved thanks to the techniques of the industrial world, with its first artificial networks: the “wonderful” railways, the telegraph, the “electricity fairy”. The Network has therefore replaced the Tree. The latter’s linearity and natural verticality has been opposed to the former’s multirationality and apparent horizontality. In Saint-Simonian thought it conjures the equality of the brothers against the hierarchy of the Father. This is one of the factors underpinning its efficiency and power.

The reticular techniques which constitute the infrastructure of hyper-industrialized societies are proliferating and, according to Manuel Castells, seem to outline the structure of a networked “informational capitalism”. Simultaneously, the figure of the network is omnipresent in all disciplines, from biology to mathematics, from sociology to political or organizational science, and even claims to define the modalities of thought processes through the cognitive sciences and connectionism. The network, a multidimensional object and fetish word, has become a *doxa* for contemporary thought.

All that remains today are the images and ideologies of the network, but these are the decayed remnants of a social utopia and conceptual thought developed in the early nineteenth century by philosopher and sociologist Henri Saint-Simon (1760–1825), who conceptualized industrial society. We are left with a “technology of the mind” and “a symbolic image” that re-interpret an ancient imaginary of the network with every technical change. This is what we call a *retiology*, a neologism created by contracting *retis* (network in Latin) and *logos*, that is, a set of representations, discourses and images supported by technique-networks.

Archaeology of the Network

The genealogy of the network highlights three major visions of the reticulated in the West, which relate to three technical configurations of the network, emphasizing the indissoluble link between the technique-network and its social representations.

The first and very ancient representation, found in mythology, particularly Greek mythology, relates to thread, fabric and weaving: it is a biometaphysical vision of the network-net symbolizing continuity, the thread of life, time and Destiny.

The second emerged at the end of the eighteenth century, with the formation of a new *episteme* formalizing the network and rationalizing it into a logic which, with

the “industrial revolutions”, brought in new territorial technical networks, such as railways, the telegraph and then electricity. Saint-Simonianism systematized this second configuration into a biopolitical vision of the reticular in which two political paradigms of the network (centralized/decentralized) are contrasted, and which is driven by a social utopia.

Finally, in the twentieth century, with the computer and information and communication techniques, a third configuration elaborated by John von Neumann and Norbert Wiener emerged, that of the self-regulated techniques symbolic of the brain and of “collective knowledge”, all embedded in a “biotechnological” vision of the reticulated. The communication network is thought of as a nervous system or a brain; since Galen in Antiquity (129–200 CE), these organs had been defined with reference to technical networks. Galen saw the brain as a *rete mirabili*, comparable to fishermen’s nets. These images and representations between body and technique work both ways. That is why reticular techniques have historically been intertwined with the metaphor of the body: for a long time, from Antiquity to the Enlightenment, the network was “on” and “around” the body; it enveloped the body. At the end of the eighteenth century, the network was identified with the body, and then externalized as an artefact enveloping all of nature, particularly territory. Finally, since the nineteenth century, the body has been entangled in the artificially created technical transport and information networks which constitute its new social environment, maybe even a new society. The network has now cast its nets around society as a whole, as though it has successively enveloped the body, nature, and then society. Memories of these captures have been deposited in strata within the same “network” object, making it possible to circulate from one referent to the other. From Antiquity to the seventeenth century, an imaginary of the network as an inter-world between the weaving technique and the organism developed. At the end of the Enlightenment, this imaginary gave way to a triple rationalization: that of the Promethean productions of the engineers constructing artificial networks; that of the formalization-mathematization inaugurated by Leibniz and Euler, and finally that of the construction of a symbolism of social change meant to materialize through reticular techniques. In its meshing, the textile technique delivered a “graphic reason” to interpret the human body from Antiquity to the Enlightenment. Network and body then faded into a single rationality, a little before the modern technical network found its rationality within the body, from the Industrial Revolution. In other words, for a time the imaginary of the network gave way to the concept in Saint-Simon’s philosophy, before deteriorating into an invasive vulgate of the network, an ideology and technology of the mind.

An Inter-world Between Technique and Body

There are two dimensions to the Network, one technical and the other techno-imaginary. A network is first a technique that evolved over the course of history, taking on three main forms: “technical systems” as understood by Bertrand Gille

(1978), that is, a craft weaving technique from which *réseau*, the French word for “network”, derives (*retis* in Latin); the major artificial territorial networks that emerged from the industrial revolution; and finally, the information and communication networks that emerged from the information technology revolution.

The network is steeped in an imaginary that is always associated with a technical system. From Antiquity to the seventeenth century, it referred to threads and weaving, to nets or wickerwork, in other words, a crafted form of the reticular. With the industrial revolution, the network became a large self-regulated mechanism thanks to the steam engine that made railways possible, and the technical network was embedded in the territory. Since the mid-twentieth century, with the invention of the computer and John von Neumann’s “automata networks”, the network has appeared as a self-reproducible technique, even qualified as “intelligent”.

Though trilogies structuring history should be considered with caution, it is worth noting that the history of network techniques matches the chronology of the three-phase industrial civilization put forward by Lewis Mumford (1934) in *Technics and Civilization*: until the eighteenth century, the “eotechnics” phase, when network-weaving prevailed; the “paleotechnics” phase of the eighteenth and nineteenth centuries, linked to the industrial revolution, when the major artificial territorial networks built by engineers appeared (transport, energy and communication); and, finally, the “neotechnics” phase that characterizes modern industrial civilization, in which information technology and telecommunication networks have emerged.

Irrespective of the variations in the technique-network concept that characterizes “technical systems”, the metaphor associating networks with organisms has lasted. To track down the paths of invention of the network, I argue that, as a technique, it cannot be separated from its representations as a “techno-imaginary” – a technique-network and technology-network –, and particularly not from its organicist metaphors.

The network was formalized and mathematized in the early nineteenth century, when it became a grid for interpreting space-time: a space-time matrix or rather a matrix of the “territory” it envelops like a new body. It became a “territorial network”. Historian of techniques André Guillerme (1988: 8) points out that this modern meaning appeared at the beginning of the nineteenth century only, when the term was applied to basin hydrography (1802), to geology (1812), to the organization of fortifications on national territory (1821) and to the water distribution pipe system (1828). It was generalized as a result of the organization of a large system of communication channels and financial institutions in the Saint-Simonians’ industrial “Manifesto” written in 1832, by one of their leaders Michel Chevalier (1806–1879). That is precisely when the double construction of the concept and the modern myth of the network occurred. A theory and a symbolic articulation of the network were to be the work of the Saint-Simonians.

The Cult of the Network Among Saint-Simonians and Proudhonians in the Nineteenth Century

For half a century from 1825 to 1875, particularly under the Second Empire, Saint-Simonian engineers and industrial actors worked towards developing railway networks, electrical telegraphy networks, and funding and training networks in France, Europe and the Arab countries. They theorized the industrial revolution and sought to socialize the major technical networks: this consisted in both conceiving of the socio-economic integration of the new networks, and devising modes of regulation, going so far as the “socialization of the means of production” which they suggested long before Marx, in *La Doctrine saint-simonienne* of 1829, under the impetus of one of their leaders, Saint-Amand Bazard (1791–1832). In order to carry out this socialization of the new territorial networks, particularly railways, the Saint-Simonians developed what was no less than a cult of the network, showing all the facets of the virtuous alliance that enabled an evolution from the communion of brothers to universal association and communication through networks. They enacted this communion in their church, staged the “association of the brothers” in their workshops and work seminars, and illustrated communication in their industrial and financial network policy. Communion was to proceed from the associated brothers’ work applied to the entire planet, for the fertilization of nature with communication networks. Through such public interest work, the world could be reconfigured into an ideal organism composed of artificial networks that would transform it. Saint-Simonian religious practice consisted in creating an ideal artificial body, by drawing networks and superposing them onto the “natural” body of France and the Mediterranean, in other words its territory, to ensure the circulation of all flows in society. The object to be enveloped by the technical network was no longer just the organism or nature, but territory and society as a whole. Saint-Simonian engineers and entrepreneurs established themselves as the prophets and actors of this new technical, industrial and financial encircling.

Saint-Simon’s doctrine was reformulated in modern terms of territorial networks primarily by the economist Michel Chevalier. In order to produce the modern idea of the territorial network, he had to fetishize the technical object to make it the symbol of “universal association”. The territorial network could thus become the object of a cult through which the new technical network was equated with a radical change of society. This myth is still very much alive, as it is revived with every technical innovation, from the railway to electricity, IT or Internet and social networks. It conveys the belief that creating a new technical network amounts to triggering a change of society, economic mode of production, or even civilization. Michel Chevalier was the first to formulate this modern myth, in the early 1830s. Pierre-Joseph Proudhon (1809–1865), the father of anarchism, then reformulated it by creating a political cleavage within technical networks: depending on whether the network is centralized or not, the vision articulated will be either monarchical or revolutionary.

The Reification of the Concept of Network by Michel Chevalier

With the famous article-manifesto on the Saint-Simonians' industrial policy, *Le Système de la Méditerranée* (*The System of the Mediterranean*), published in the newspaper *Le Globe* on 12th February 1832 under the name of its editor Michel Chevalier, the network became the symbol of universal association. Following the schism of the Saint-Simonian Church in November 1831, this text translated the doctrine into a symbolism and cult of the network. The transition from the domination of men to the association of brothers could be made possible only by the development of communication networks, with communion and communication between East and West. With the network, the struggle between East and West could be "passed through" and "surpassed": it would unite the two, the flesh and the spirit, woman and man. East-West communion was identical in nature to that between the flesh and the spirit in the Christian religion. As another Saint-Simonian leader, Emile Barrault (1799–1869) declared: "Now that I have painted you a picture of the struggle and pacification of the East and the West in humanity, I can easily reveal to you, in each of you, these two worlds under the names of spirit and flesh, of thought and action, of intelligence and matter, struggling against each other and waiting for a law to harmonize them".² This fusion, a sort of Eucharist, is symbolically accomplished by the network which, for the believers of *New Christianity*, played the same role as Christ in traditional Christianity: a place of transubstantiation between body and spirit. With *The System of the Mediterranean*, Chevalier translated the schismatic split in the Saint-Simonian Church into action by placing the construction of communication networks at the center of their new cult.³ If we are to appreciate the immense impact of this article, we need to consider it within the context of broader Saint-Simonian reflection at the beginning of 1832. It was the application of a "sermon" by Emile Barrault on East–West communication, delivered on 15th January 1832, which was essentially about struggle and the communion between spirit and flesh. This sermon required Barrault to "briefly outline their struggle in humanity between the peoples that have been its most energetic representatives, between the East and the West, followed by their impending reconciliation". Barrault posited an opposition as the starting point of his reasoning, an "eternal dualism", in other words a general contradiction, that between the East and the West. It then became a matter of knowing how to overcome this fundamental opposition, how to move from the struggle between

²Émile Barrault, Sermon of 15 January 1832, *Le Globe*, 16 January 1832.

³The first four articles, including "*Le Système de la Méditerranée*", are titled "La paix est aujourd'hui la condition de l'émancipation des peuples" (Peace is now the condition of the emancipation of peoples), and signed by Michel Chevalier. They were published on 20 and 31 January, and 5 and 12 February 1832. They followed the publication of Émile Barrault's sermon in *Le Globe* on 16 January and inaugurated a series of Saint-Simonian propositions on the development of industrial policy.

two generic terms to their union, to harmony, and then to universal association. The Mediterranean, the historical locus of East-West confrontation, had to become their cradle of communion, through their envelopment by the communication networks that would allow the transition from domination to association. The encirclement of the Mediterranean by railways connecting the major harbors and by telegraphic networks provided the means to implement *New Christianity* (the title of Saint-Simon's last book), with a view to achieving communion between East and West. Barrault hoped to see this "new religion" prevail, to finally "unite in a solemn marriage the spirit and matter, science and industry, theory and practice, the East and the West, until then bound to struggle and antagonism! And what a moving spectacle humanity will present, when on the edges of the Mediterranean... Europe, Africa and Asia, as though on the edges of an immense and magnificent cup where they had made communion but by staining it with their blood, will now reach out with open arms of friendship and make peaceful communion together, and in this sublime harmony, will provide the symbol of the universal association we have just founded". Two weeks after the publication of Barrault's sermon, Chevalier started his series of articles presenting the project called *The System of the Mediterranean*, with which to connect the East and the West through a host of communication channels, and which prefigured "the universal association" by developing generalized circulation and international trade. In the first article, Chevalier added to Barrault's equivalences in relation to the East-West pair, with that of industry versus war: "Industry is eminently pacific. It instinctively rejects war. That which creates cannot reconcile with that which kills".⁴ On that basis, Chevalier proposed "the main outlines of a plan" intended to "eternally secure a pacific future of prosperity and glory for the peoples of the world".⁵ But he did not wish to simply demonstrate that peace is essential, he also sought to offer a "practical, implementable conclusion" and to provide means of action. Saint-Simonians saw the East-West conflict as the matrix of all social conflict, the most crucial of all. They wanted to see the Mediterranean transformed from a battlefield into a space of cooperation and association, a driver of universal peace. How could the Mediterranean evolve from a battleground to the "nuptial bed of the East and the West"? How could "the political consecration of harmony between matter and the spirit" be achieved at the same time?

"The Mediterranean", wrote Chevalier, "has been an arena, a closed field where, for three centuries, the East and the West have fought each other. The Mediterranean now ought to be a vast forum around all of which previously divided peoples will unite". From the arena to the forum, Chevalier made communication networks the instruments of an industrial and pacific construction, the technical matrices of the development of the Mediterranean basin.

⁴Michel Chevalier, "La paix est aujourd'hui la condition de l'émancipation des peuples", *Le Globe*, 30 January 1832.

⁵*Ibid.*, *Le Globe*, 5 February 1832.

The Network as an Action Lever

The “general system” of the Mediterranean imagined by Chevalier makes each major port in the Mediterranean a place of interconnection of interlinking networks between the land, the sea and the inland waters. It even prioritizes the networks, into primary and secondary: “The port thus determined will serve as a pivot for a host of operations, the most crucial of which would be a railway. Going up the median valley, it would journey above or through waterways, to find another major valley. For the large river basins generally constitute the most natural industrial divisions, and all these partial systems tied together would constitute the general system. (...) All around the Mediterranean will thus be a primary network onto which secondary networks will be woven, especially so that the lines of communication converge towards the ports, which will serve as centers for each basin”. There again, networks are connected to one another to create a system. Michel Chevalier described what should constitute the pivotal ports and associated networks, to serve Spain, Italy, Germany, Turkey, Russia, Asia and Africa, and thus painted “the delightful picture of what the old Continent would soon be”. To this end, he deployed the full technical and symbolic wealth of the notion of communication network, even drawing on the metaphor of the body: “such a railway”, he wrote with regard to Spain, “with all its branches... would be like a system of veins and arteries along which civilization in motion would awaken dozing Spain from its slumber, and connect its disjointed limbs”. For the entire *The System of the Mediterranean*, he envisaged “a vast system of banks spreading a healthy chyle in all the veins of this body with raging activity, and countless joints”. The artefact network brings the territory it envelops to life and fertilizes it, just as the natural network is meant to ensure the body’s life. The technical network weaves itself into the territory and thus becomes a territorial network. “Such is our political plan”, Chevalier concluded, “combined with the moral work designed by our supreme Father, of whom it is the material translation. It shall one day ensure the triumph of our faith”.⁶ In the early 1830s Chevalier’s project, the material translation of the doctrine became the action programme of many Saint-Simonians. In these articles of the newspaper *Le Globe*, Saint-Simonian religious practice was asserted as an industrial cult and a political-financial communion around the fetishized communication networks. The network was seen as a link that could be both material and spiritual (here referred to as “immaterial”). This is what Michel Chevalier put forward: “Industry, leaving industrial actors aside, is comprised of production centers held together by a relatively material link, that is, by transport routes, and by a relatively spiritual link, that is, by banks. (...) There are such close relations between the bank network and the transport network, that if one of them is designed according to the best suited configuration for the exploitation of the planet, by virtue thereof the other sees its fundamental elements determined in the same manner”. The modern notion of network was explicitly used for the first time by

⁶Ibid., *Le Globe*, 12 February 1832.

Chevalier, who thus distinguished between two families of technical networks – material, such as transport, and immaterial, such as the banking system – and at the same time emphasized their interdependence. This distinction was a cornerstone of modern thought on networks, which still associates the material infrastructure-network with an immaterial management, exploitation or financing network. But Chevalier took this further by specifying that communication networks had until then been the preserve of engineers alone, whereas their political significance was decisive, insofar as they contributed to achieving universal association: “Since those who have studied them [the means of communication] the most are engineers and do not claim to be anything else, the political and moral question has been neglected and the focus has been restricted to technical issues”. In other words, the network was understood as both a technique creating ties – combining a material infrastructure and immaterial funding – and a political-moral operator serving as a system. Thus reified and fetishized, the network operates on two fronts: the one technical-financial and the other political-symbolic. It is more than a technique and an instrument of transition; it is the symbolic and practical operator of the Saint-Simonian religion, enabling the merging of East and West, of mind and body. The network is both a means of overcoming the original conflict and an end, as it definitively resolves the contradiction by creating pacifist universal association. Thanks to it, war is transformed into its opposite, universal association.

Networks thus become more than technical matrices built by engineers: they are symbols of social transformation, facilitating the transition from conflict to communion. To grasp their significance, their appearance as technical infrastructure needs to be overlooked. In other words, seeing the network as a technical object simultaneously amounts to effacing it, to reveal its truth in universal association. While the reification of the network is a first step towards its fetishization, the latter in turn reveals a symbol behind a thing. *The System of the Mediterranean* conceals networks as things (technical links) and reveals them as symbols (social links): “In the eyes of the men who believe that humanity is moving towards universal association, and who devote themselves to leading it there, railways appear in an entirely different light. The railways along which men and products can move around at a speed that would have been deemed mythical twenty years ago will remarkably multiply relations between peoples and between cities. In the material order, the railway is the most perfect symbol of universal association. The railways will change the conditions of human existence”.⁷ Chevalier saw the development of networks as a political revolution, turning a communication technique into a policy: “The large-scale introduction of railways on the continents and of boats on the seas will constitute not only an industrial revolution, but a political one too. Using these, and with the help of a few other modern discoveries, such as the telegraph, it will become easy to govern the major part of the continents surrounding the Mediterranean”.⁸ This assertion contains one of the main themes of the contemporary

⁷Michel Chevalier, *Le Globe*, 12 February 1832.

⁸*Le Système de la Méditerranée*, *Le Globe*, 12 February 1832.

symbolism of communication networks, which has become an ideology: the technical network fetishized as an instrument of social transformation. The technical part is equated to the totality of the social dimension. It follows from this that the technical network amounts to social change. Chevalier wrote that the day communication networks were developed, “an immense change will have occurred in the constitution of the world”, for technical networks directly produced social change. Michel Chevalier even went so far as to describe the founding phases of network ideology: “Improving communication means working towards real, positive and practical freedom... it means creating equality and democracy. Perfected means of transportation have the effect of reducing distances, not only from one point to the other, but also from one class to the other” (Chevalier 1836, vol.II: 3). Technical communication networks inherently bear positive social change: the elimination of, or collaboration between, social classes. Communication networks mean democracy, association and equality. Conversely, the social issue (reducing the distance between classes) is pared down to a technical issue (creating communication networks). The engineer becomes the leading architect of social transformation. By reifying the network, Chevalier transformed a contradictory tension into a non-contradictory connection. Thanks to the network the contradiction is turned around or reversed into an association. The technical network enables communication, communion and democratization through the egalitarian movement of people. The geographical reduction of physical distance, even the interchangeability of places, owing to communication channels, results in the reduction of social distances, in other words democracy. In his Political Economy course at the Collège de France, in 1841–1842, Chevalier declared that “railways are democratic agents, in the legitimate and regular sense of the term. They put within the reach of all classes a means of transport that eliminates previously existing inequalities in the means of communication accessible to people” (Chevalier 1842: 378).

Michel Chevalier established a technocratic and liberal understanding of society which has been perpetuated in the contemporary ideology of the network: the technical network is now synonymous of democracy, movement, equality. Through the network, contradiction is eliminated, transformed into its opposite, the communion of opposites. That is why implementing the technical communication network in and of itself amounts to social change. Chevalier’s liberal industrialism was founded solely on the virtue of the multiplication of communication networks to transform society. This theoretical position also supported a political position: it was not unrelated to the increased proximity between Michel Chevalier and the government, which was criticized by Barthélémy-Prosper Enfantin (1796–1864). Indeed, after turning down a venture in Egypt for an official mission in the United States, Chevalier publically announced his split from Saint-Simonianism.

In 1832 the word “network” in its modern sense appeared throughout Saint-Simonian engineers’ writings, not only in Michel Chevalier’s articles in *Le Globe*, but also in a collective volume published in September, *Vues politiques et pratiques sur les travaux publics en France* (“Political and practical views on public works in France”), authored by the engineers Lamé, Clapeyron and the Flachet brothers

(Lamé et al. 1832).⁹ These Saint-Simonian texts on the network answered “Father Enfantin’s” request for Michel Chevalier, Stéphane Flachet and Henri Fournel to devise a plan on the “work particular to France” designed “as a first element of a general undertaking” to fulfil the project of “universal association”.¹⁰ Stéphane Flachet surrounded himself with a group of Saint-Simonian engineers, including his brother Eugène, to write *Vues politiques et pratiques sur les travaux publics de France*. In this book, they discussed technical networks and the related financing and regulatory issues. It is an important work for two reasons: first, it often uses the term “network” in the modern sense (of a territorial technical network) and second, it constitutes the first systematic Saint-Simonian contribution to the elaboration of a theory of modes of network regulation. If we compare the meaning of the word “network” in two 1832 Saint-Simonian texts, namely Chevalier’s article and the edited volume *Vues politiques et pratiques*, we see that both use the term in the modern sense of a technical communication system planning and developing a territory. The authors of the book thus noted that from the eighteenth century, by creating “a large network of royal roads”, the State “covered the territory with a vast network of roads connecting the most remote regions of France to those where civilization, industry and agriculture were the most advanced” (Lamé et al. 1832; 27 and 33). In both texts, a “general communication system” operationally translated into the combination of several artificial networks. A system was therefore defined as a network of networks, following the organic model. For Michel Chevalier, the interweaving of networks (material and immaterial, primary and secondary) generated the general communication system. The same idea is found in *Vues politiques et pratiques*, through the combination of railways and canals, or of networks of different sizes: “Our general internal communications system must consist: (1) for primary networks, of wide canals and railroads for locomotive engines; (2) for secondary networks, of narrow canals and railways worked by horses and machines” (ibid.: 91). The combination of networks is the practical translation of the generalized communication system that Saint-Simonians called “universal association”, and which Michel Chevalier defined as follows: “from the political point of view per se, universal association is the organization of a system of industrial works that embraces the entire world”.¹¹ The symbolism of universal association is translated into the implementation and interconnection of technical networks enveloping the world. From this perspective, the interweaving of networks leads to the formation of universal association: the network must be “put

⁹Gabriel Lamé (1795–1870), an 1814 graduate of the École Polytechnique, became a physics professor at this school. Émile Clapeyron (1799–1864), an 1816 graduate of the École Polytechnique, took part in the construction of the Paris-Versailles-Saint-Germain railway and was elected to the Corps Législatif in 1868.

¹⁰This is what Michel Chevalier reported in his article in *Le Globe* on 30 March 1832, entitled “Politique d’association, politique de déplacement” (“Association Policy, Movement Policy”) – cited in the pamphlet *Politique industrielle et Système de la Méditerranée*, June 1832. Rue Monsigny, n°6. Paris (Paris – Fonds Enfantin Bibliothèque de l’Arsenal, FE 957, pp. 29–39).

¹¹Michel Chevalier, *Le Globe*, 30 March 1830.

together” by “interconnecting water transport, internally and externally”, wrote the authors of *Vues politiques et pratiques* (Lamé et al. 1832: 102). The interconnected networks constitute a sort of fabric which envelops territory and society. Covering the planet with networks and thereby fertilizing the body of the Earth-woman was the modern myth founded by Saint-Simonian engineers, and which is still pursued by technical network development policies to this day. The “System” built by Saint-Simonian engineers likens the feminine Earth encircled with artificial networks to a living organism, a network of natural networks. The engineers built the ideal social system of “universal association” from a complex combination of differentiated artificial networks, primary and secondary, material and spiritual, railway networks, road networks, canal and telegraphy networks, etc. The cult of the Saint-Simonian religion is expressed rationally, in the construction of networks, for engineers are established as demiurges capable of computing and creating a social system by combining networking artefacts. If the network is the elementary structure of a system, a social system can be planned through a combination of networks: this is the plan of action of *The System of the Mediterranean*. A complex system can be composed by combining networks of very different natures (banking and communication), sizes (primary and secondary) or types (canals-railways-telegraphy). It thus becomes possible for engineers to imagine and construct an ideal social body, through the combination of networks interconnected on the model of the human body. Nineteenth century Saint-Simonian engineers’ know-how was thus extended and applied to the treatment of the social body, not least by sociologist-engineer Herbert Spencer later on. The demiurge engineers, capable of creating the networks of an ideal social body, were the best suited to define the conditions of implementation and exploitation, including the modes of regulation. The authors of *Vues politiques et pratiques sur les travaux publics en France* argued that the regulation of networks could be thought of in terms of a trilogy of hypotheses, which I will refer to as “the thesis of the three theses”. The management of a network can be entrusted either to the State or to private companies, or else be performed through a mixed solution, such as concession: “Three systems can be envisaged for the implementation of public projects: (1) The government may be solely responsible for implementation with funds obtained from taxes or loans. (2) Implementation may be left entirely to companies’ speculation; it is then their responsibility to determine which works promise sufficient returns to justify the spending they have assessed, and then to collect the funds, manage construction, oversee maintenance, and see to improvements. (3) Implementation may be entrusted to companies, subsidized and monitored by the government. The companies execute the terms they agreed to, in which the main details of the projects are set out. They comply with certain conditions for maintenance, improvements, reduced rates, etc.” (Lamé et al. 1832: 256–257). The economic and political regulation of the network advocated in this book corresponds to its symbolic-political function. Because the network symbolically performs the transition from a military and state society to an industrial and entrepreneurial society, its economic regulation can only be an intermediary between State and enterprise. To adequately fulfil its “transition” function, the network requires “mixed” regulation, between State and enterprise,

public and private. In his *Cours d'Economie Politique* at the Collège de France, Michel Chevalier extensively developed this thesis of “mixed industrialism”, a mix of interventionism and liberalism. The “thesis of the three theses” seems consubstantial with the notion of network: it is the equivalent, for the issue of regulation, of the symbolism of the network contrasting opposite images to better reunify them with the idea of association or communion of opposites.

In 1830, three Saint-Simonian leaders, Prosper Enfantin, Saint-Amand Bazard and Michel Chevalier came together, symbolizing three possible paths for the potential development of the Saint-Simonian theory of the network. In November 1831, the first (and major) schism of the school took place, between Bazard on the one hand and Enfantin-Chevalier on the other: the interpretation of the Saint-Simonian theory as a tool for social transformation was excluded in favor of a religion based on the reformist cult of networks, advocated by Bazard. In March 1833, a second schism took place, between Enfantin and Chevalier: the former emphasized the religious aspect of the cult of the network, while the latter prioritized a liberal and technocratic understanding of the development of networks. In October 1833, Enfantin left for Egypt to participate in building the Suez Canal and to implement the Saint-Simonian symbolism of networks, for the achievement of universal association. At the same time, Chevalier had gone to the United States to study networks, and was advocating a political economy of communication networks as an end in itself. In the wake of these “schisms”, the theoretical unity of the network concept was shattered. Within the Saint-Simonian movement itself, it was split into at least three separate understandings, which can be simplified to the extreme as: (1) a policy of social transformation that uses the network concept to think about the transition towards a future society, with Bazard; (2) a religion of universal communication carried out by the networks fertilizing Mother-Earth, with Enfantin; (3) a liberal and technocratic political economy of communication networks, with Chevalier. Later approaches to the notion of network, which observed its multidimensionality, even its indeterminacy, merely brought together and tinkered with scattered pieces of this Saint-Simonian “fragmentation”.

Once the demarcation line was drawn within the movement, most Saint-Simonians, starting with “Father Enfantin”, applied themselves to creating technical and financial networks, which then constituted Saint-Simonian religious practice. These Saint-Simonians were to form “a saint militia... an army, under the banner of universal association”, as one of them, Charles Duveyrier (1803–1866), wrote as he urged the School to take action: “Words are therefore no longer enough, we need facts; we need to move from speech to action, from the programme to the enterprise”.¹² After the failure of their retreat at Ménilmontant, the Saint-Simonians scattered. However, many of them, particularly Enfantin’s relatives, devoted themselves to the creation of networks for the movement of money, knowledge and communication, until the end of the Second Empire. In 1858, Enfantin took stock of the Saint-Simonian industrial and financial promotion of the development of

¹²Charles Duveyrier, *Politique industrielle*, *Le Globe*, 21 February 1832.

railways, the electrical telegraph and banking and financial networks, and reflected on Chevalier's industrial *Manifesto*: "This is why Michel wrote the *System of the Mediterranean* where he outlined the plan of this gigantic building project that no one but us was considering at the time, which cost billions and is now almost finished" (Enfantin 1877 in Saint-Simon and Enfantin 1865–1878, vol. 46: 211). Enfantin considered his work done; in his words, "we have embraced the Earth with our networks of railways, gold, silver, electricity! Spread the spirit of God and the education of humankind through these new channels, of which you are partly the creators and masters" (Enfantin, *Le Cr dit intellectuel*, 1866 quoted by Pinet 1898: 165–166). This declaration neatly sums up the intention behind the Saint Simonians' action: communication networks were created as a religious practice to "embrace the planet". It was a real act of love of the Earth fertilized by the network, an envelopment of society by technical networks. All Saint-Simonian projects were embedded in this religion of universal association, seeking to develop a generalized circulation of flows across the world, reflecting the perfection of the network.

Saint Simonians were the first to think about railways in terms of networks and to see a political and social revolution therein. Others followed, such as anarchist thinkers Proudhon and Kropotkin, who went so far as to introduce a political cleavage within the mode of development and the architecture of communication networks, between the advocates of full state centralization and those of decentralizing equality. Proudhon limited the revolutionary scope of networks as envisaged by Enfantin and Chevalier: for him, the network could bring about a social revolution only under certain political conditions of organization and regulation. The Saint-Simonian myth of social transformation achieved automatically by the development of a new communication network was reformulated by Proudhon, who saw the very architecture of the technical network as a societal choice.

A Type of Society Embedded in the Structure of the Network

With Saint-Simonianism, the network enters society and becomes socialized. With Proudhon, it is society that enters the network. The technical network is not only a means to envelop territory and society, for, according to Proudhon and Kropotkin, the choice of a social system is nested within the internal structure of technical networks. Proudhon thus saw a mode of social organization in the structure of technical networks. A centralized network means a centralized society and vice versa. Proudhon applied this analysis to railways, and Kropotkin later used it for electrical networks. It implies that the technical network and society define each other through the similitude of their structures. The process of fetishization of the network set in motion by Chevalier, which consisted in taking the particular (the technical network) as the global (universal association, the change of society), was extended by Proudhon. Indeed, he brought fetishization into the very architecture of

the technical network: a part of the network, its structure or its “framework”, amounts to a type of socio-political organization.

Proudhon was of the mind that exchanges and flows in society had to be multiplied in order to increase individuals’ freedom and to improve social dynamics. Proudhon and Chevalier shared the same starting point: the analogy between the human body and the social body: “Just as blood circulation is the mother and driving function of the human body, so too the circulation of products is the mother and driving function of the social body”, wrote Proudhon (1851: 201). The revolutionary political programme of June 1848 was grounded in this principle: “All the ills afflicting the social body can be related to the cessation or to a disruption of the circulatory function. The circulation is nil. There is a crisis” (1848: 140). The railway and waterway transport networks are the very symbol of this circulatory mobility. In terms very close to those of Michel Chevalier, Proudhon wrote in 1845: “Railways remove the intervals, make people present with one another everywhere... railways, due to the nature of their service and to their phenomenal development, affect everything and determine everything”. The railway “erases and levels all inequalities of position and climate” (1868a: 264 and 297). But this positive effect of the network is perverted by political centralization and economic monopoly. In 1855, following the great law of 1842 which organized the railway lines in France radially from Paris, Proudhon wrote *Des réformes à opérer dans l’exploitation des chemins de fer* (1868b, vol. XII), to speak out against the State monopoly of railways. He advocated a mixed system in which the State funds infrastructures and leaves the management in the hands of private companies. He thus drew on the “thesis of the three theses” formulated by Lamé, Clapeyron and Flachet. Proudhon stressed the importance of the images and representations associated with a technical network, particularly in its early days, and had already adopted a critical stance with regard to these discourses: “After 30 years of existence, from a political economy perspective the railway is still a myth”, he commented in his preface. “The public itself, after indulging in the most fanciful hopes, was then overcome with wariness and tormented by the most insane imaginings. (...) Not to mention, alongside the chattering of the sages and quackery, the alternately apologetic and accusatory clamor of the subordinate interests which, depending on the sentiment animating them, take a stand for or against railways, curse them or laud them” (ibid.: 2 and 4), he wrote, with emphases that we still find articulated today, “for or against” the Internet. He added that the railway “is used as a theme by a new kind of agitator”, and recalled that “an archbishop, in a sermon at Lent, denounced the railway before his pious flock, as signs of revenge from the sky for the incredulity of men. An even more fanatic author, announcing the arrival of the antichrist, warned that the electric telegraph and the locomotive were symbols of its cursed power. Democracy, on the other hand, salutes railways as vehicles of equality, more effective than those of 1793” (ibid.: 5). Proudhon was the first to criticize the ambivalent social representations of the technical network: for some, it was a curse, the symbol of power, for others, the symbol of equality. Having criticized the symbolic dimension of networks, he in turn took a stand to shift the terms of the political-symbolic confrontation. He replaced the antichrist-democracy

opposition he denounced with the “more real” contradiction between the centralization of power exercised on the network and another form of management based on “federating unity”: “Waterways, primitively provided by nature, left the Gallic territory divided into as many commercial regions, independent of one another, as there were drainage areas. Roads were intended to unite these separate regions; canals had no other destination. All of these channels put together therefore form a system of general equality, a sort of federating unity. By decreeing railways, the 1842 law seems to have wanted to change this whole tradition, which is not only commercial and political, but also pertains to transport. Instead of continuing the work that canals and roads had started so well, the law followed the impetus of the monarchical idea that sees Paris as the Queen of Gaul, and each province as a fiefdom that is tributary to the capital. All our railways, like beams, start at the center of the government”. Proudhon was the first to contrast two categories of technical networks comparable to two political visions applied to reticular artefacts: “On the chequered network, a federating and egalitarian network of land roads and waterways, has thus been superimposed the monarchical and centralizing network of railways, which tends to subordinate the départements to the capital” (ibid.: 97–98). Proudhon contrasted the figure of the chequered network, seen as “natural” and egalitarian, with that of the monarchical and centralized “artificial” network, characteristic of “the princely, governmental concept of the radial network”. The chequered network contrasts with the radial network: the forms of power are reinvested into the reticular technical architecture. Legrand’s radial organization of the railways,¹³ with Paris at the center, like the system of optical telegraph lines, was a fine illustration of Jacobin power and economic monopoly. The chequered organization is the opposite of the radial organization: in other words, a political choice is embedded in the very architecture of the technical network. In substance, Proudhon argued that it is pointless supporting mythical discourses “outside of” technique (antichrist *versus* democracy of 1793); the regulation and organization of the network should be criticized from “the inside”. The structure of a technical network conveys a choice of economic policy: this Proudhonian assertion has been abundantly drawn upon to this day, articulated in the form of equivalence between the structure of a technical network and the organization of a society. According to Proudhon, the railway inherently produces a beneficial revolution of human relations, by multiplying interaction and removing intermediaries: “by virtue of the consistency and regularity of their service, further aided by telegraphic correspondence, railways have the effect of bringing the producer and consumer into direct contact, irrespective of the distance between them, and consequently of removing intermediaries” (Proudhon 1855: 293). The network is an “admirable” figure in anarchist thinking, for it defines pure transition or flow, a direct relationship that cannot be institutionalized. Proudhon explicitly saw duality in the railway: he identified it as both a circulation technique and the symbol of an economic policy.

¹³Alexis Legrand (1791–1848), general manager of the department of civil engineering, outlined the plans of the first French railway network centralised in Paris, hence the name “Legrand’s star”.

His criticism was concerned with the discrepancy between the technique and what it symbolized (freedom and equality). By reuniting the technical and social forms of organization, in other words by disseminating a technique democratically, in accordance with its potential, the symbol will disappear: “since the railway has communicated its eminent qualities... to the whole social order through a sort of magnetization, it is reasonable to predict that one day the railway as a symbol will become worn-out” (ibid.: 366). Proudhon thus saw the technological fetishism promoted by Saint-Simonians as simply a moment in the development of a network; one that faded with the social dissemination of the use of techniques.

Proudhon’s opposition between centralization and the federating structure with regard to railways was used by Peter Kropotkin (1842–1921) in relation to electricity: the electrical network affords the possibility of decentralized structures and organizations. One of the effects of the “reticular revolution” is its capacity to transform organizations, to shift from centralized and hierarchical structures to small entities associated through networks. In his book *Fields, Factories and Workshops*, Kropotkin (1910 [1898]) argued that electricity provides new impetus to small industries, and used the example of businesses in the Monts des Lyonnais and certain rural regions of England. He maintained that small industry develops alongside large centralized industries, “where waterfalls have been exploited to obtain electrical power in villages, and where machines were used in large cities to produce electrical light during the night... the small industries are experiencing a new expansion” (ibid.: 281). He saw this as a means of transition towards free federations of groups of producers and consumers. Thanks to electricity, small industries can develop, including by working during the night in the cities, and work from home, which is less tiring than in the large factories, becomes possible: “Far from disappearing, on the contrary these small industries tend to develop, especially since in certain large cities, like Manchester, electricity has afforded a cheap driving force, in the exact measure required in a given moment” (ibid.: 253). Kropotkin gave multiple examples to show that the electrical network allowed for small production units, on a human and family scale, “the small establishments where manufacture can take place in the best conditions”, as opposed to “monstrous factories”, or “large factories”: the network makes decentralization and even self-management possible. Not only does electricity ensure productivity, for there is constant lighting to work, it makes it possible to remain in one’s usual environment, thus avoiding the uprooting of workers with their forced migration to the big cities.

The Technological Utopia of the Network

From the Saint-Simonians to Proudhon and Kropotkin, that is to say, in a century during which railway, telegraphy and electricity networks developed, the modern notion of network unfolded in all its complexity, as a myth and as a territorial technical matrix.

To its credit, the fetishization of technical networks facilitates their social dissemination, by transforming them into symbols of a policy of generalized exchange, that of “universal association”. But according to Proudhon, this over-symbolization conceals a more concrete issue: the economic policies of network regulation inherent in their very mode of organization. By identifying political choices within the architecture of networks, Proudhon sought to drain the symbolic excesses of some Saint-Simonians, particularly Chevalier. The Saint-Simonians had rid the social utopia of its burden, by transferring the promise of social change to the technical network, the railway, a symbol of “universal association”. This transmutation of the Saint-Simonian “social semi-utopia”, to use philosopher Raymond Ruyer’s (1950) expression, into a full-blown technological utopia, was achieved through the fetishization of technical networks. Proudhon therefore reacted to this excessive symbolization of networks that legitimated the theoretical-political stance of the liberal wing of the Saint-Simonians close to Napoleon III, by re-embedding the political into the organization of networks. In concrete terms, the technical network is admittedly more of an agent of social transformation in its internal architecture than in the images it conveys. With the twofold Saint-Simonian and Proudhonian intervention, the terms of the debate on networks were lastingly set and were to become real ideological “markers”. First, the concept of network deteriorated into a “technology of the mind” and second, the modern myth of transformation achieved through the technical network, even in its architecture, prevailed and was repeated with the emergence of each reticular innovation. This recurrent modern myth announced a new social and economic revolution with the birth of electricity, the telephone, the computer, CTI, cable, satellite and the Internet.

This myth, developed around 1830, was reactivated with the appearance of each new technical network: electricity, which Lenin claimed defined socialism by associating it with the “power of the Soviets”, and the telephone, followed by Internet, considered as the “nervous systems” of society. In the mid-1990s, US vice-president Al Gore declared to the international community: “the President of the United States and I believe that an essential prerequisite to sustainable development, for all members of the human family, is the creation of this network of networks [Global Information Infrastructure – GII]. [It] will circle the globe with information superhighways on which all people can travel. (...) The distributed intelligence of the GII will spread participatory democracy... I see a new Athenian Age of democracy forged in the fora the GII will create”! Commenting on the Arab Spring in 2011, Hillary Clinton asserted that “Internet is freedom!”, once again turning a technique into a symbol.

The intense period of invention of the early nineteenth century has left us with the legacy of a “technology of the mind” and a “techno-messianism”, as well as their combinations; in short, an ideology of the network that we here call a *retiology*, which is readily presented in the form of a utopia.

Retiology or Network Ideology

Contemporary *retiology* combines two deteriorated and worn-out components: first, a concept that has become a technology of the mind and second, a symbolic or techno-utopian (or “techno-messianian”) operation through the fetishization of reticular techniques. First of all, what do we mean by “technology of the mind”? This is a canonical reasoning process through which engineers and industrialists theorize their design, construction and regulation practices in relation to territorial technical macro-networks.

Let me also clarify what is meant by “techno-utopia” or “technological utopia”, the second component of *retiology*, which comes in two forms: either “techno-messianism” (positive vision), or “techno-catastrophism (negative version). The Saint-Simonians and the Proudhonians were the first militant-manufacturers of the images associated with reticular techniques. The technical network and even its architecture then carried the images of a new society and of “universal association”. Finally, contemporary *retiology* is comprised of the remnants of the dilapidation of reticular symbolism, reduced to imagery and narratives, which support the practices and the promotion of the technique.

The ideological triumph of the network relates to its theoretical vacuity and its loss of symbolic references. This *retiology* combines a concept reified into a technology and a utopia embedded in the fetishized technique, so as to celebrate each reticular innovation as an extravaganza announcing a “new world”.

With the proliferation of technical networks since the end of the nineteenth century, the modern mythical narrative of social transformation through the network and its architecture has been reactivated and reviewed with each innovation of the reticulated techniques, from electricity to the Internet. This recurrent action to resuscitate a symbolism of the reticulated has been officiated by mainly engineers and industrialists, who spread the webs of networks over the entire planet and throughout society. Engineers legitimize and socialize the artificial networks they design, using organic images of the reticulated. Engineer-sociologists envelop their technological productions with reticulated metaphors borrowed from the human body, until body and network, brain and computer, again become one and the same. Engineers endeavor to liken artificial networks to a living body, to associate them with corporal images, particularly pertaining to the brain, and thus to naturalize techniques. The electricity, electronic or telecommunication networks are even claimed to be “intelligent”, to constitute a sort of “collective brain” or “global brain” which artificially embodies the Galenic metaphor (Galen’s *rete mirabili*) on a global scale. The Saint-Simonian image of the social transformation effected by the technical network and embedded in its architecture by the Proudhonians has prevailed as a great modern myth, a narrative that has been vulgarized not only by engineers, industrialists and “futurologists”, but also by certain sociologists. Chevalier and Proudhon’s idea of a political and social structure inserted into the technical network, which acts as a modern “hidden God”, explains this recurrent reactivation. The network becomes a lever for political and social transformation,

perceived and used in all organizations to make them evolve. Just as the Enlightenment thinkers, particularly in Diderot and d'Alembert's *Encyclopaedia*, identified hidden networks everywhere in organisms and Nature, so too contemporary ideology decrypts them in organizations and territories.

This narrative, which is mobilized with every reticular technical innovation, always draws on corporal metaphors, particularly comparing the technical network with the nervous system and the network with the brain, so that it may prevail as a new figure of power or counter power, in organizations and in society. Engineer-sociologists and industrialists have used and worn out this figure, drawn from Saint-Simonianism, recurrently presenting each "new" technical network as a means of transforming society, the economy and organizations. This deterioration of the Saint-Simonian vision into "techno-messianism" comes in the form of a "techno-utopia". The techno-utopia of the technical network has been repeated with a few invariants, from electricity to the Internet. As for the concept of network, contemporary discourses have reduced it to a "technology of the mind", a frequently useful reasoning process, the content of which is however limited to describing relations or interconnections between elements of a fragmented whole.

Across the diversity of reticular practices, the network ideology eternally promises social change or, more simply, the creation of movement and mobility through "connection" prosthetics. The network now catches everything and anything in its nets. It has become an ideology, a *retiology* that recycles the symbolic images it has held, particularly the promise of a transition towards the future. The technical macro-networks, great contemporary technological and industrial undertakings, are the modern "cathedrals of the celebration of passage". They no longer reach towards a celestial beyond, but dramatize alternately the transition towards a better world to come and the continual setting in motion of the present.

The Reticular Techno-Utopia

The mythical narratives of the network are repeated to saturation point by engineers and industrialists to promote their innovations. The techno-utopia of the technical network again takes up two main themes: first, the ancient narrative of the inter-world between body and technique, introduced by Galen, which draws a parallel between the body, particularly the brain, and the network, and second the modern narrative stemming from Saint-Simonianism and Proudhonism, which sees the technical network as a lever, if not an identifier, of politics. The link between the body and the network is maintained, but the other way around, as it is now the body, particularly the brain, that serves as a model for conceptualizing the artificial network. As for the mythical Saint-Simonian narrative of social change effected by the technical transformation of networks, it is repeated with every technical innovation, reaching new heights with the Internet, which signaled the beginning of a "new Age", of a "new economy", and of the "network society" which Manuel Castells prophesied. The network-manufacturing engineers-sociologists use the

images and metaphors of reticulated techniques to socialize their innovations and to take them out of their laboratories, so as to project them into society. The Saint-Simonian vulgate produced by engineers from the *École polytechnique* paved the way for the fetishization of the network with railways, and for the formulation of a “techno-utopia” of the network based on a few invariants or “markers”. Like any mythical narrative, this techno-utopia relies on recurrent apologetic discourses (or terrifying discourses, which amount to the same thing, “the other way around”) articulated at the time of the emergence of electricity networks at the end of the nineteenth century, and then of telecommunication and finally IT networks. These discourses always present the new network with reference to the organicist metaphor and to the technical-political utopia of social transformation: the new network will be “alive” and “revolutionary”. Such dramatization seems necessary for the promotion of each technical reticular innovation. To develop industrially and culturally, the technical network must become a “technical system”, as understood by Bertrand Gille (1978), even a “technical macro-system”, as defined by Thomas Hugues (1983) and Alain Gras (1997), combining technical networks and power systems to form a whole.

The Six Markers or Invariants of Reticular Techno-Utopia

By the mid-nineteenth century, the mythical narrative of the network had essentially taken shape with the development of railways. The long history of the reticular imaginary that defined it as an inter-world between organisms and techniques was supplemented by the Saint-Simonian and Proudhonian contributions. These fictions were characterized by the theme of socio-technical “revolution” through the fragmentation of the existing society and the promise of a new one. They were also steeped in the metaphor of the brain or nervous system, stemming from the medicine of Galen, reworked by Descartes – who both likened the brain to a network or net –, and applied to new technical networks. Since it had the same logical functioning and a similar material architecture, the technical network was seen to be to society or the planet, what the brain and the nervous system were to the human body, that is, the regulatory organs. I suggest a selection of six “markers” to outline the contemporary mythical narrative of the network, shaped by the memory of the multiple contributions that made the Saint-Simonian operation possible, before expanding into a techno-utopia. They constitute the vulgate or *doxa* of discourse on the network, disseminated and rearticulated by engineer-sociologists with every innovation. These markers can be thought of as the scoria of the long work performed on the idea and image of the network, particularly during the first half of the nineteenth century.

1. The first, most powerful and oldest marker was set by Galen and then rearticulated by Ambroise Paré and Descartes. It associates the network and the body, and in particular likens the brain to the network. From the nineteenth

century this analogy was reversed, as the focus was then not so much on explaining the body through the network, as on legitimating the artificial network with the image of the natural organism. This marker can be labelled “biotechnological” or “Galenic-Cartesian” (Galen/Descartes). Just as the textile network had allowed for the rationalization of the organism, so the organism was used to naturalize the artificial network. From the nineteenth century onwards, images were traded between artificial and natural networks. The naturalization of the technical network helped it to become embedded in society by presenting it as necessary for the renewal of the social body. The network is comparable to a human organism, or to one of its parts (bloodstream or nervous system). As in the body, networks interlink and multiply to ensure fluidity and social flow. The modern artificial network draws its rationality, its regulatory model and its naturalization from the archaic figure of the body-organism. It gives itself a body to be socially integrated. The purpose of this metaphorical discourse of the organism, essentially articulated by engineers, is to convince the political sphere, industry, the market, users, etc. The crucial advantage of the model of the organism is that it immediately, “naturally” offers a mode of regulation to the new artificial network, before it becomes a “technical macro-network” over the long term. It provides the technical network with cohesion, harmony and expressivity: the body or organism-network is a model. Each organ, particularly the brain, or the body as a whole, can be taken as a model of rationality to think about and promote the new technical network. Moreover, the model of the organism-network naturalizes and acclimatizes the new technique, even makes it “user-friendly” and articulates it with the social, by tying in the parts with the whole. The technical network is thought of as the nervous system or bloodstream, or as the brain which regulates society as a whole. The corporal metaphor illustrates the technical-social shift announced by the emergence of the new technical network.

2. The second marker of the network is not so much Cartesian as Leibnizian; it signals that the network can be formalized. The network follows a logic, an order, even a “graphical reason”.¹⁴ It can always be drawn, in the form of a graph associated with a matrix. The functioning logic of the network is embedded in the outline of its structure, in its architecture. As Jacques Bertin highlighted in *Semiology of Graphics* (Bertin 2010), the graph offers a “rational image”, which differs however from the figurative or mathematical image; it is “a language for the eye”.¹⁵ The network is represented by links (or correspondences) drawn up between places (or elements) on a map. Unlike the diagram, the network graph seeks “the most effective and simplest image possible”. In the diagram, a meaning is attributed to the dimensions of the map before placing correspondences, whereas the network aims towards “the disposition that offers the least crossovers or the simplest figure”. In other words, it seeks a meaningful, simple

¹⁴Based on the title of the book by Jacques Goody (1977).

¹⁵See in particular p. 269 and the following pages on networks.

and effective order, but without prior meaning: only the presence of elements and links matters.

3. The third Saint-Simonian marker stems from Michel Chevalier's *Manifesto*. The technical network always announces a technical and therefore social revolution, through the fragmentation of the existing social structure and the promise of modernity in the future. The network transforms society: electricity, IT, telecommunications, transport or the Internet produce "post" societies (post-modern, post-industrial, etc.). With the proliferation of technical networks since the end of the nineteenth century, the utopian narrative of social transformation accomplished by way of the network has been revived and modified with each new networked innovation. This recurrent enactment of the reticulated has been officiated primarily by engineers, who spread the webs of their networks across the planet and in all spheres of society. It is no longer a matter of enveloping Nature or the body in technical networks, as it was during the Enlightenment, but society as a whole, now and in the future. The network is seen as inherently "revolutionary": from Lenin's "soviets of electricity" to US vice-president Al Gore's "highways of information", the new networks are claimed to provide democracy, transparency, freedom and equality.
4. The fourth marker is again Saint-Simonian and formulated in Chevalier's *Manifesto*. Networks contribute to peace, prosperity and universal association, as they artificially cover the Earth. The network, like a net, is thrown over the planet and the society it envelops, and even becomes its structure, both visible and invisible. The city will become a "smart city", the planet will be "relational" and society will be "networked". Each individual, activity or object must be "interconnected" with and defined through networks, starting with atomized subjects. The relationship with territory is modified. Shorter time, reduced distance, greater speed: the network "brings nearer" and modifies, or even removes, territory. It becomes a tool to plan and develop the territory, starting with urban space.
5. The fifth marker, also Saint-Simonian and rooted in Chevalier's *Manifesto*, presents the network as a bearer of prosperity, progress in new activities, the multiplication of new services, a "new economy", etc. The network is an answer to crisis, by ensuring economic development and prosperity, and the technical network is a major figure of the great modern myth of Progress. As such, it bears the promise of new occupations, and a new cycle of growth. It even allows for the definition of an economic policy (for example, today's so-called "digital" policies), by moving the object of the traditional policy onto a technical, even technicist plane, entrusted to industrialists, experts and engineers.
6. The sixth marker is Proudhonian and libertarian. A choice of society or policy is embedded within the very architecture of the network. This complements the Leibnizian marker, which outlines the content of a form. Its graph either reveals a monarchical, Jacobin, centralizing policy, or the opposite. Its architecture conveys organizational choices regarding the State, businesses, verticality versus horizontality, centralization versus decentralization, etc. Proudhon and Kropotkin were the first to clarify the nature of this network revolution: networks

can decentralize and become a means of fighting concentration, they can even become a self-management tool. A policy can be read and “seen” in the architecture of the network. There again, the network shifts the political and embeds it in technical choices. To re-examine the Proudhonian marker, Langdon Winner (1986) interpreted the concept of “affordance” borrowed from engineering by Barry Wellman, to study the “political properties” of technologies.

To sum up these six markers of the techno-utopia of networks, we can say that the network is comparable to an organism, or to one of its parts – the brain – which gives it cohesion (Galenic-Cartesian marker); it reveals the forms of a graphical rationality (Leibnizian marker); the network bears the promise of a dual revolution, both technical and social (1st Saint-Simonian marker); it brings progress and prosperity, and provides a new political answer to crises (2nd Saint-Simonian marker); the network conveys universalism, by reducing distances and time-scales (3rd Saint-Simonian marker); finally, the network embeds and reveals social and political forms of organization in its architecture (Proudhonian marker).

The three Saint-Simonian markers complement one another. They assign to the technical network the outlines of a new social system, in accordance with Chevalier’s 1832 *Manifesto*. The network is as much a symbol as it is a technical infrastructure. It is a means of transition to escape a crisis situation and achieve a state of progress, peace and prosperity. The Leibnizian and Proudhonian markers also complement each other as they reveal meaning in a form and in a reticular architecture. Finally, the Galenic-Cartesian marker is found throughout the history of the network, as it binds the network to the corporal metaphor, drawing alternately on the reticular model to rationalize the organism, and on the corporal model to naturalize and regulate the technical network. There are therefore three dimensions to the techno-utopian discourse on the network, which make its imaginary so powerful: a temporality of transition, an organic spatiality, and a graphical rationality. This “retiological” discourse is found in each of these three main dimensions:

- The network manages the social transition from a state of crisis to another state characterized by prosperity, progress, democracy and modernity;
- It naturalizes the technical network by way of metonymy, by relating the planet and the organism, or one of its parts, such as the nervous system or the brain;
- Finally, it delivers knowledge in what it shows, in a visible rationality, in a drawing.

Since the mid-nineteenth century, the technical network discourse has offered a linear temporality of social transition, a natural organic regulatory spatiality and a rationality that can be read in reticulated forms. It is as though the techno-utopia of the network offered three levels of interpretation: forms, flows and regulation. This triptych, comprised of readable forms, flows of transition and organismic regulation, has made the strength of the techno-utopia of the network and structured the recurrent discourses that go hand in hand with reticulated innovations, from the

railway to the Internet and the NBIC (Nanoscience, Biotechnology, Information Technology and Cognitive Science).

The Bio-social View of the Technical Network

The techno-utopia of the network describes differentiated network architectures, announces a social revolution enabled by the new technical network, and reactivates the metaphor of the organism-network to naturalize and regulate networks. The techno-organistic fiction, particularly the image of the nervous system or of the brain, contributes to socializing technical innovation by transforming it into a techno-political utopia. Social change is thus thought to stem from the technical network, interpreted as a hybrid being that is both artificial and natural, an organism-network. Since Antiquity, doctor-philosophers had thought about and shed light on the human body through the image of the net and weaving in order to understand its fundamental principles – to the point of seeing them, by the end of the eighteenth century, as one and the same thing. The modern engineer has reversed this logic, to use reticulated images inspired by observed or imagined network effects in the human body and, by way of metonymy, in the nervous system and the brain. This reversal is used to promote technical innovation and emphasize its transformative social impact. It is as though, in the engineer's mind, "without a body the technical network could not live", just as, without the model of the network, the doctor could not interpret the body. The engineer endeavors to give the network a body. The first to systematize it, after Enfantin, was Herbert Spencer (1820–1903), a former railway engineer turned sociologist. He formulated the fiction of the organism-network. Drawing on Lamarckian and Darwinian theories, his *Principles of Sociology* (published in three volumes from 1877 to 1896) merged the social and biological functions, in a "social evolutionism". He referred to a "determinable order" and contrasted the "fighting and predator" system of past societies with the "industrial regime" of current societies: "the contrast between the fighting and industrial types hinges on replacing the belief that individuals exist for the benefit of the State with the belief that the State exists for the benefit of individuals". In fact, Spencer's theory is based on the Saint-Simonian opposition established by Enfantin, between an "organic" or industrial society and a "military" society, which he takes to the extreme with an organicist view of the social.¹⁶ Spencer distinguished between three "organ apparatuses": producer, distributor and regulator. In the human body, the regulatory organ is the nervous system, which disseminates information in the organism: its equivalent in society is all the means

¹⁶"If the organisation consists of a construction of the whole such that it allows its parts to fulfil actions interconnected through mutual dependence, the less advanced the organisation is, the most interdependent the parts must be; while of the contrary, when the organisation is advanced, the parts' dependence is overall disastrous. This is something which is as true of the individual organism as of the social organism" (Spencer 1883-1890, vol. 2: 53–54).

of communication, whether postal services, the telegraph or press agencies. This view provided the first explicit formulation of the image of the network as a social nervous system: “The only telegraph wire”, Spencer wrote, “covering all the branches of the railway system is the wire that stops or spurs its traffic, just as the nerve covering the full length of an artery is the vasomotor nerve that regulates its circulation. (...) While suspended telegraph wires are admittedly insulated differently, the way underground wires are insulated is comparable to that of nervous fibers” (Spencer 1883–1890: 82). In 1896, sociologist René Worms took up this metaphor of the nervous system-network in his book *Organisme et société* (1896), in which he likened “roads and railways to blood vessels, the telegraph to nerves, machines to the muscles of the social body” (quoted by Schlanger 1971: 90). This corporal fiction surrounding the network to make it an “organism-network” and export it into the social sphere was cyclically reformulated for electricity and telegraph networks, by Spencer, for the computer, by Neumann and Wiener’s neuro-cybernetics, for telecommunications, by numerous engineers, for the Internet, by Joseph Licklider, and then by the ideologists of the Net, gathered around cult magazines like *Wired*. So much so, that in retrospect the contemporary celebrators of reticular techno-utopias noted that “there is an uncanny continuity in the wiring of the planet since the discovery and first application of electricity. The telegraph, the telephone, the Internet, the World Wide Web have followed upon each other as if they were stages in a single technological development”, as Derrick de Kerckhove wrote (2000 [1998]: 197).

Engineers have relentlessly drawn on this imagery, particularly to present the developments of the telephone, IT and telecommunications. Marshall McLuhan was the one to link the prophets of electrical life with those of the digital revolution. He attributed a particularly important role to the electrical revolution which he saw as projecting our entire nervous system onto the world and bringing the world back to our nervous system. McLuhan wrote: “Today, after more than a century of electric technology, we have extended our central nervous system in a global embrace, abolishing both space and time” (McLuhan 2001: 21). And he added his famous sentence: “As electrically contracted, the globe is no more than a village” (ibid.). In *The Gutenberg Galaxy*, McLuhan borrowed Teilhard de Chardin’s idea of “noosphere”, which he interpreted as the “technological brain for the world, [...] the cosmic membrane that has been snapped round the globe by electric dilation of our various senses” (McLuhan 1962). Electricity inspired the author of *Understanding Media* to write pages of mystical inspiration on the electricity network: “In this electric age we see ourselves being translated more and more into the form of information, moving toward the technological extension of consciousness... By putting our physical bodies inside our extended nervous systems, by means of electric media, we set up a dynamic by which all previous technologies (...) will be translated into information systems” (McLuhan 2001). He summarized this fusion between electricity and the nervous system in a key sentence: “Electric technology is directly related to our central nervous system” (ibid.). The technical network and the biological network are extended until they are one, in accordance with the Cartesian marker of the reticular techno-utopia. These texts by McLuhan

regarding electricity still fuel discourses on telecommunication networks and Internet.

The Communication Network: Society's "Nervous System"?

From the time it was born, in the 1880s, the telephone was seen as one of the "marvels of electricity" and extended the fictions fostered by electricity. Throughout the twentieth century the image of the "nervous system" promoted by Spencer was used by engineers and industrialists in telecommunications and IT to "give substance" to the network. This image was thus used by Theodor Vail, the head of American Telegraph and Telephone in its early days, for whom "the Bell system was developed in a spirit of intelligent control and as a large structure, to the point of merging with the nervous system of the country's economic activity and social organization (it even de facto became this nervous system)". This image of a society's nervous system is commonly used to define the telecommunications network, constituted of links and nodes, lines of transmission and commutators, all of which are increasingly "intelligent", to the point of being identified with the brain.

Reference to society's nervous system is recurrently used to define the network in the discourses of engineers and political figures on telecommunications. Some engineers, however, prefer to use the Saint-Simonian markers of the reticular techno-utopia – as was evidenced in a 1994 public report on "information highways" by Gérard Théry, former general manager of telecommunications in France –, and the Proudhonian marker to associate a type of social organization with a technical network architecture. The former approach emphasizes the socio-economic "revolution" brought about by the telecommunications network, to provide evidence of a political orientation, while the latter stresses the similarity between the reticular and organizational architectures, to promote new modes of management. The introduction to Gerard Théry's report starts with a sentence assembling the markers of engineers' reticular fiction, inherited from Saint-Simonism: "The revolution of the year 2000 will be that of information. While its technical scope will be comparable to that of railways or electrification, it will have more profound effects, for telecommunication networks now constitute the nervous system of our societies" (Théry 1994: 11). This statement establishes a causal link between the new technical network and social transformation seen as self-evident: telecommunication networks bring about a social revolution, for they are the nervous system of society. The use of Saint-Simonian markers of reticular fiction is facilitated by the fact that these networks are said to be "intelligent", for "information highways constitute the medium of the post-industrial society, essentially built on information exchange". This revolution "will fundamentally modify economic structures, modes of organization and production, each and everyone's access to knowledge, leisure, work methods and social relations". The Saint-Simonian marker of economic prosperity promised by the network is predominant

in the demonstration. “Awareness of a new society emerging will thus develop”; this is a “post-crisis society, the information society” (ibid.: 121). for this techno-utopia conveys a vision of society to be achieved through the development of technical networks.

The famous 1978 Nora-Minc Report on the computerization of society, made the very direct assertion that: “Data processing offers the means to implement the most diverse schemes, the ‘Tout-Etat’ [complete centralization of state control] as well as that of extreme decentralization. Thus, guiding the acquisition of data processing means selecting a model of society” (Nora and Minc 1978: 105). In order to legitimate the 1982 “Cable Plan”, the French government drew on telecommunications engineers’ discourses to the letter and contrasted networks with “a so-called ‘tree’ structure, similar to those of water and electricity networks, able only to convey one-way traffic”, with “radial networks, the structure of which is mapped onto that of the telephone distribution network, needed to evolve towards the offer of interactive services”. Meanwhile, the evangelists of the Internet put the libertarian reference to the decentralized structure of the network, representative of a type of egalitarian society, at the heart of their discourse, which Christian Huitéma sums up as follows: “Unlike radio or television, the Internet is not a one-way medium. What is most revolutionary about the network is precisely the individual’s capacity to be both a consumer and a source of information. (...) The Internet, far from being an institution of control, will on the contrary be an instrument of freedom, promising modern humans the ability to shake off the yoke of bureaucracies (...). In computerized businesses the emancipation of communication from hierarchical channels is already visible and, gradually, hierarchies are being flattened, fearful deference and arrogant certainty are giving way to egalitarian dialogue” (Huitéma 1996). The analogy between broadcasting networks and the hierarchical structure of a pyramidal organization leads to a critique of state centralization, which is likened to Orwellian controlled communication. The libertarian markers of reticular techno-utopia facilitate the transition from engineering to sociology, as networking structures inspire organizational or even societal models that seamlessly merge with one another. The two facets of the network, technical and organizational, are perfectly reversible thanks to the similarity of their architecture. The reticular form yields meaning, as a “graphical reason” applicable to diverse objects, some technical, others social.

Neuronal Networks and the Computer

The identification of the communication network with the nervous system was popularized by early cybernetics, which brought psychologists and mathematicians together, and particularly by Warren McCulloch (1892–1969) and Walter Pitts (1923–1969). In their famous 1943 article, “A logical calculus of the ideas immanent in nervous activity”, they asserted that “the nervous system is a network of neurons” (1943: 62). As early as 1923, McCulloch had imagined an equivalence

between the calculation of propositions and the rules underpinning the functioning of the nervous network. Meanwhile, in 1923–1924, Pierre Janet, professor at the Collège de France, wrote that “the brain is but a set of commutators” (quoted by Canguilhem 1993: 15). In their 1943 article, McCulloch and Pitts showed that “neuronal networks” are comprised of elementary interconnected “formal neuron” units: the neuron networks that constitute the cortex are formalized into “formal neuronal networks”. They explained thought as the product of the brain’s material structure, that is to say, of the neurons functioning as a network which allows for constant interaction within the brain. “A formal neuron”, Henri Atlan commented, “is constituted of a body, or soma, from which outlets or axons lead to one or several endings divided into exciters and inhibitors. Each module of this kind receives endings from other modules..., via connections called synapses” (Atlan 1992: 129). The functioning of nervous activity may be formalized using propositional logic: “it seems that each network’s behavior can be described in these terms if more complicated logical tools are added for networks containing loops; moreover for any logical expression that fulfils certain conditions, a network can be found that behaves according to the model described” (*ibid.*). The aim here is to constitute a logic through the propositional calculation of the “behavior of complicated networks”. This is possible as “each neuronal reaction corresponds to an assertion of an elementary proposition” (*ibid.*: 64). McCulloch and Pitts’ model associates a logical machine with a biological machine. Even if McCulloch and Pitts’ formal neuronal networks are “schematizations of real neurons”, resembling them somewhat, Atlan notes that they showed that “the functioning of the brain and that of artificial automata obey the same principles” (*ibid.*: 133). In fact, in the 1943 article, McCulloch and Pitts (1943) likened the brain to the computer: “the brain may be likened to a digital computing machine consisting of ten billion relays called neurons”, therefore “the brain is a logical machine”. However, since the human brain is “by far the most complex of data processors”, the analysis of its mode of functioning will apply to any other complex system. Given that in the brain “each relay is a living cell”, the referent of the two forms of “relay-cell” is a telecommunication network. Conversely, the brain remains a model for the engineer: even if “engineers cannot hope to compete with nature (...) computing machine designers would be happy to swap their best relays for nervous cells” (*ibid.*: 195).

As early as 1944, the computer was considered as an artificial brain, for the nervous system was the prevailing metaphor to think about electricity and telephone networks. Turing and Von Neumann dreamt of building a reduced model of the human brain, or at least an automaton whose functioning would obey a similar logic, an “electronic brain”. Von Neumann saw a similarity between the functioning of a calculator’s logic and that of the human brain: “the nervous system”, he wrote, “is a computing machine which manages to do its exceedingly complicated work on a rather low level of precision” (1958: 78). This comparison between the brain and the computer is not self-evident, as it assumes an analogous functioning and architecture. Philippe Breton (1990: 140) highlighted two understandings which liken the computer to the brain: the one likens the comparable material

infrastructures of the machine to those of the nervous system, as two material networks (the one machine, the other neuronal) designed to “provoke thought”; the other sees two comparable logical modes of functioning. In other words, does the neuronal network obey a binary logic, of the Boolean type, a condition of the logic programming cerebral and computer activity, or can it be a structure that produces intelligence in general? Turing and Neumann argued in favor of the latter. According to this hypothesis, which sees neurons as binary, the brain and the computer share the same logical functioning. This “computer scientist” thesis differs from the one supported by cyberneticists. Whereas Turing and computer scientists insisted on the logic of “intelligence”, irrespective of its material medium, cyberneticists sought to construct artificial animals, by working on “the material medium of intelligence”. In *Cybernetics and Society*, Norbert Wiener explained: “It is my thesis that the physical functioning of the living individual and the operation of some of the new communication machines are precisely parallel in the analogous attempts to control entropy through feedback” (1988 [1950]: 26). Comparable regulatory mechanisms exist in the organism and the machine: “This is the basis of at least part of the analogy between machines and living organisms. The synapse in the living organism corresponds to the switching device in the machine” (ibid.: 34). On this basis, Wiener compares the telecommunication network and the living organism: “there is no absolute distinction between the types of transmission which we can use for sending a telegram from country to country and the types of transmission which at least are theoretically possible from transmitting a living organism such as a human being”, for “to be alive is to participate in a continuous stream of influences from the outer world” (ibid.: 141). Wiener’s cybernetic human is situated at the heart of a network. Traversed by a network, he/she is plugged in, connected and communicative. “The representation of the human as a ‘communicative being’ is closely intertwined with the metaphor which associates the human brain and the computer”, claimed Philippe Breton (1992: 52).

The Technology of the Reticular Mind

The technology of the mind, understood as a canonical reasoning process used in various disciplines, is the expression of the dispersion and commercialization of the concept that has become a “precept” with the fact of being in a network and thinking in terms of it. This deteriorated concept is a catch-all which, albeit useful in various disciplines, loses all substance by accounting for everything. Common to all its uses is the reduction of the network to the hidden structure of a system, a formalizable architecture made up of intertwined links or relations, in other words, interconnections. This structure tends to become the universal key to explaining the functioning of a complex system whatever it may be (society, brain, body, city, planet, world, etc.). The reverse is also true: detecting or imagining a network architecture in or under a complex system is enough to deduce its mode of functioning and transformation. The network defines a hidden order that can be

acted upon. Mapping the uses of the word by discipline would reveal its presence in many disciplines: the information and communication sciences, the engineering and territorial development sciences, geography, but also history, the social sciences (network economics, management and the management sciences, the organizational sciences, sociology, political science), physics, biology, the mathematical theory of graphs, the cognitive sciences, etc. Across the board, the “hard” or “natural” sciences employ the network concept, which they seek to formalize using graph theory and “automata networks”.¹⁷ They apply these theoretical models and formal tools in various disciplines to explain complex systems.

The focus here is not so much on this formalization as on the relationships between the techno-utopia and the technology of the spirit of the network, in other words, on the interaction between engineers’ discourse and the social sciences in addressing social functioning and change. The term “reticular expressivity” could be used to identify these intermediary narratives between the socialization of technical networks and the technicization of social change. These discourses draw on a hybrid technical-social definition of the network, play on its dual half-technical half-social character, and equate the technicization of the social to the socialization of techniques. The structure of the network thus plays a mediating role between technique and society. The network serves two purposes, as a technical matrix and as the structure of organization, even of the social realm as a whole. The network is at once a “technical network”, an “organizational network”, and the transition between the two. The technology of the reticular spirit at play in socio-economic discourses complements engineers’ techno-utopias. It reveals the difficulty in conceptualizing the network other than metaphorically or by reducing it to a structure explaining a system.

The Pyramid and the Network in the Discourse on the Sociology of Organizations

In the late 1960s, Europe and the United States engaged in an intense trading of concepts to characterize the rise of the Fordist model of industrialism, and to outline its new “post-Fordist” type of organization, built around “a service economy”. By 1967, the issue of “the information revolution” imported from the United States had already been widely popularized in Europe by Jean-Jacques Servan-Schreiber’s *The American Challenge*, in which he wrote that “a technological revolution is underway. Its impact on modern society should be radical” (1967: 105–106). Meanwhile, US sociologist Daniel Bell, in *The Coming of Post-Industrial Society*, and a former adviser of the White House, Zbigniew Brzezinski, in *Two Ages: America’s Role in*

¹⁷ An *automaton* is a basic processor defined by three characteristics: an intense state, connections (with other automata or an environment) and a transition function allowing it to calculate its internal state based on the signals it receives about its connections.

the Technetronic Era, both theorized this transition towards “post-industrialism”.¹⁸ Daniel Bell saw the concept of post-industrial society as the outcome of a change in the social structure through technology: “The aim of formulating the concept of post-industrial society is to highlight a change in the social structure”; “the notion of post-industrial essentially refers to the transformations of the social structure” (ibid.: 153 and 418). Yet, “insofar as social evolution is linked to that of technology, the major changes in the next fifty years will stem from the telecommunications revolution. From 1825 to 1875, we experienced half a century of British supremacy: it was the fruit of the railway revolution” (ibid.: 428). Bell argued that technical transport or telecommunications networks transform society through its structure. This idea, directly inspired by the Saint-Simonian approach, very quickly gained currency. It was developed as “hyper-industrialism” by Alvin Toffler and John Naisbitt, as “post-modernity” by Lyotard, and as “network society” by Manuel Castells who updated the approach in the era of Internet. However, many authors mediated between the Saint-Simonian discourse on industrialism and Bell’s new take on post-industrialism. According to Bell himself, these authors included US sociologist Thorstein Veblen with his 1919 book *The Engineers and the Price System*, Wiener with cybernetics, and James Burnham, who played a key role in the sociology of organizations, with *The Managerial Revolution: What’s Happening in the World*. The definition of contemporary society as a transition towards “post-industrial” society was transferred into managerial discourse in the 1970s by Alvin Toffler who, with hints of Neo-Saint-Simonianism, researched “the transition from industrialism to super-industrialism” (Toffler 1985). Toffler explained this transition as follows: “Industrialist bureaucracies have a pyramidal structure (. . .)”, whereas “any country that turns the page of the industrial chimney era needs decentralized, ultrafast networks with a high capacity to circulate considerable masses of computer data, video images and other types of messages, alongside conventional telephone calls” (Toffler 1986: 135 and 143). The Nora-Minc report followed suit, transferring into the political field this theme of the “shift from the organic industrial society to the polymorphous information society” (Nora and Minc 1978: 114), brought about by the “CTI revolution”. In this report, the network is considered in ambivalent terms, both as a technique for the circulation of information and as a mode of social organization. It serves two purposes, as an information technique and an organization structure: “The challenge (...) lies in the difficulty of building the system of connections that will allow information and social organization to progress together” (ibid.: 16). The main assertion is that the network changes organizations and society as a whole. In the same year, in *The Network-Nation: Human Communication via Computer*, Starr Roxanne Hiltz and Murray Turoff (1978) discussed “the network nation” which could “re-unite individuals and groups dispersed over wide distances... and recreate emotional bonds”;

¹⁸“Daniel Bell was unchallenged as he launched the concept of ‘post-industrial society’. This notion was already at least implicit in the book he published in 1960, entitled *The End of Ideology*”, wrote François Bourricaud in the preface from the French edition (Bell 1976).

thanks to group communications, “we will become the Network Nation, exchanging vast amounts of (...) information”. The authors argue that images of communication networks and social organizations can be reversed, as the network corresponds to a dual technical-social structure. This allows engineers to socialize techniques, and sociological discourse to make the social technical. The Proudhonian network marker acts both ways: a network architecture reveals a choice of social organization and, conversely, the social organization becomes adequate for the technical networks it uses. Two structures are systematically contrasted as symbolic figures of power by engineers and sociologists specialized in organizations alike: the vertical pyramid and the horizontal network. In the early 1980s John Naisbitt pointed out in *Megatrends* that one of the “ten new directions transforming our lives” is the transition from “hierarchies to networking: For centuries, the pyramid structure was the way we organized and managed ourselves”. . . “From the Roman army to the Catholic Church, to the organization chart of the General Motors and IBM, power and communication have flowed in an orderly manner from the pyramid’s top, down to its base (. . .) The reticular model we have now all adopted with extraordinary success is replacing the hierarchical form” (Naisbitt 1984: 247 and 251). Naisbitt advocated “destroying the pyramids” through “networking”, for the network, he claimed, would ensure what “the bureaucracies can never provide: horizontal law” (ibid.: 247 and 255). This discourse on reticulated organization, popularized by management and futurology discourse, found theoretical benediction in *The Postmodern Condition* by Jean-François Lyotard, who explicitly followed in the footsteps of Touraine and Bell with their “post-industrial society”, and in the context of the frequently referenced Nora-Minc Report. Lyotard argued that the precondition of post-modernity is the fragmentation and disaggregation of the social and its dispersion into “clouds of sociality” which reconstitute themselves into “intersections” where “each of us lives” (1979: 8). The figure of the network is presented as a flexible rearrangement of the social pyramid, following its prior disintegration into clouds. This reticulated figure founds (and is founded upon) a new technological legitimacy, that of informational and computer-telephone integration (CTI) networks: “Where, after the metanarratives, can legitimacy reside? The operative criterion is technological” (ibid.). Consequently, wrote Lyotard, “no self is an island; each exists in a fabric of relations that is now more complex than ever before... located at ‘nodal points’ of specific communication circuits” (ibid.: 31). In short, the networked technological prosthetics is the product of social disintegration. Commenting on Lyotard’s contribution, philosopher Dominique Lecourt rightfully highlighted the importance of the technicist discourse on networks in Lyotard’s work: “The postmodern mind readily worships technology... The lesson it offers is clear: the new information and communication techniques provide a powerful contribution to networking a society that has become decentered, de-pyramidalized, tormented with countless unstable flows allowing individuals’ activities to unfold over the course of a more or less exhilarating nomadism” (Lecourt 1999: 106–107). The “post-industrialist” and “post-modernist” discourses are extended to saturation point by the management and economic discourse on “post-Fordism”, which celebrates enterprise and

“decentralized” networked organizations. The hierarchical industrial enterprise gives way to the flexible, relational, contractual, networked enterprise. The neo-Fordist enterprise brands itself “network-company”: organized with, by and into networks. It contrasts with the “pyramidal” Fordist enterprise organized like a “castle”. Federico Butera thus wrote: “we are currently leaving the model of the “castle” scientifically described by Max Weber, developed and implemented by Mary Theresa of Austria and Henry Ford, perfected in detail by Taylor and Fayol... The new organizational model is that of the network” (Butera 1991: 14). All the markers of the reticular techno-utopia are mobilized to legitimate this “reticular management”, starting with the corporal metaphor, as illustrated by Georges-Yves Kervén who claims to have philosophically founded a discourse on the network company: “The company may also be analyzed as a network connecting brains together. The company thus appears like a network of brains, themselves networks of neurons. The company is therefore a network of networks... and resemblances exist between the brain of neurons and the network of brains, insofar as the brain analyses and structures the company as a network of brains” (Kervén 1993: 138). In *Face à la complexité, mettez du réseau dans vos pyramides* (*Faced with complexity, put some networking in your pyramids*) (Sérieyx et al. 1996), in which he popularized these images of the structure of organizations, Hervé Sérieyx meted out one of his managerial sentences: “The network is becoming the favorite mode of action of the era of intelligence, of complexity”. He summarized this managerial ideology in a few slogans which are revealing of contemporary discourses on the network: “the pyramid divides up the work and at best adds up the tasks; the network multiplies the added value of contributions. The pyramid is frozen; the network benefits from a variable geometry. The pyramid centers itself on its own functioning; the network forever coevolves with its environment”; “The pyramid was the tool of manufacturing, the network is the tool of brain-factoring” (ibid.: 13 and 15). The pyramid thus relates to a “mechanic model” and the network to a “biological model” (ibid.: 14). The network is likened to the organism and contrasted with the pyramid-machine: “The network organization is the complete opposite of the pyramid organization: its development is cellular, the cell adapts, grows and divides to survive by transmitting its genetic code, just as living systems do”, Sérieyx explained (ibid.: respectively 95 and 15).

Just as the engineer uses the organic metaphor to naturalize the technical network, so too the economist uses it to naturalize the market. This model of reticular management ideology was critiqued by Luc Boltanski and Eve Chiapello, who saw the 1990s as the time of triumph of the “model of the firm as network”, because “hierarchy is a form of co-ordination to be excluded” (1999: see 111–123). This “rejection of hierarchy” is thought to afford autonomy and formal equality. The network-company is thought of as a fabric of interconnected autonomous projects, and the manager becomes the symbolic figure of the “networker”. The network is presented as the technology of the spirit which allows for the encounter of two “post” ideologies (industrial, modern, Fordist): communication and management. As it links technical communication networks with organizational

management networks, I propose a neologism, “comm-management” (Musso 2000) to refer to the intermingling of these two ideologies.

The Actual Components of Retiology

Retiology, the contemporary ideology of the network, merges the techno-utopia and the technology of the reticular spirit. It combines a deteriorated and worn-out concept and symbolic operation, to celebrate the new technical networks and convey the promise of transformations in society, customs, services, organizations, the economy, territories, etc. *Retiology* produces an inflation of intertwined images and discourses. This imagery surrounding reticular techniques and technologies supports the industrial propaganda of the *efficiency* (Legendre 2001: 59) and the “visionary” discourses on the future of the network society. *Retiology* is an ideology with utopian aspirations, a technological utopia, in other words a utopia whose referent is reduced to the fetishism of technical networks, particularly Internet and teleinformatics networks. *Technolâtrie* (worship of technology), “techno-imaginary”, “techno-messianism”, “techno-utopia”: all these terms refer to this fetishism of the technical network that is meant to illustrate a “hidden God”, creator of new social links, new communities, or even a new society. As Georges Balandier aptly put it, “The very modern image of a networked world can thus conjure up again other, very ancient images, through which lost or exotic civilizations have defined or still define their world as a complex and therefore fragile and uncompleted fabric” (2001: 14). *Retiology* takes as its object what Balandier calls the “encapsulated social, in other words caught in the envelope of global networks” (ibid.: 37). Its interpretation of the “social fabric” and its fate refers to its ultra-modern technical weavings, the Web, the World Wide Web. *Retiology* is the contemporary ideology of the Web, it relates not only to Internet, “the network of networks”, but to all works whose elements intertwine and interconnect.

Drawing on the Saint-Simonian markers of reticular fiction, *retiology* announces the future society – the “post” society – already at play in the construction of technical networks, the *imaginaries* and the practices they bring about. *Retiology* constitutes a set of discourses and imagery, of “theorized practices” of networks, if not to say the claim of constituting a discipline. It already has “retiologists” and takes on the task of managing this transition and tension towards a promised future which unfolds in various ways: sometimes through the generalized liquefaction of the social, for example in the cyberspace woven by Internet and the social networks that see to the creation of communities; and sometimes through universalized fragmentation, then global reweaving, as for example in Manuel Castells’ “network society”. Cyberspace and “network society” are both figures that were constructed as reflections of the Internet, and constitute the two dimensions of *retiology*, that is, two enactments of the “social fabric” with the help of the Web. Whether in the form of cyberspatial literary fiction or socio-economic analysis of the network society, *retiology* forever announces “revolutions of (and through) networks”. To this end,

retiology draws on ancient imagery of the reticular narrative which facilitates the projection of the network society and cyberspace into the future. As a utopian ideology, it produces and reproduces old futures. The fetishized figure of the network, the object of the “new techno-worship” (expression from Balandier 2001: 34), always alludes to the “passage”, in two main forms: the transition towards another state, and constant movement. The network sometimes refers to a future society rewoven by networks, in which case it serves as a sort of horizontal cathedral of post-modern times, and at other times it is just the sign of permanent transformation, of movement per se, in which the present society is constantly caught.

So as to question contemporary *retiology*, let us examine its two faces of Janus: on the one hand, its literary cyberspatial variant, advocated by cyberculture, and on the other, its sociological variant that defines the transition towards a “network society” and “informational capitalism”, defended by Manuel Castells.

Cyberspace or Generalized Liquefaction

The techno-utopia of cyberspace, the Internet’s contemporary twin, sounds the triumph of the Galenic-Cartesian marker of the network. Cyberspace conveys the image of a universal network connecting all the individual brains plugged in on a global scale which, according to “retiologists”, constitute a sort of “global brain” as Joël de Rosnay (2000) calls it, which produces a “collective intelligence”, to use Pierre Lévy’s term (1999, 2001). In fact, this techno-utopia was built by Joseph Licklider, a psycho-sociologist working with MIT engineers, in a 1960 article called “Man-Computer Symbiosis”. Licklider took John von Neumann’s work on cybernetics in another direction, with the dream not so much of creating a machine that would be the brain’s duplicate, but of interconnecting the brain and the computerized machine: “The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly” (Licklider 1960: 4). He sought a “partnership” rather than a substitution between the brain and the computer: what he called a “symbiotic relation between a man and a (. . .) machine” (ibid.: 6). That is why he envisaged the creation of an IT network for generalized exchange between humans and computers. In 1968, Licklider co-authored an article with Robert Taylor, head of the ARPA’s IT center, from which the Internet was to emerge. In this article they predicted that “men will be able to communicate more effectively through a machine than face-to-face... life will be happier for the online individual because the people with whom one interacts most strongly will be selected... communication will be more effective and productive, and therefore more enjoyable” (quoted by Flichy 2002: 41). This techno-utopia makes cyberspace a place where brains and computers are plugged into one another. To this end, they are both broken down into identifiable parts (the electronic chips equivalent to neurons) and “interconnected” to produce a small “intelligent” totality (the brain and the computer) that can be extended into a “large totality” built by analogy, that

is, the “global brain” (linking up the interconnected brains and computers), endowed with “collective intelligence”. This series of metaphors leads to a twofold identification: the brain is a computer and, like the computer, the brain has a reticular neuronal structure which supports intellectual activity.

The founding syllogism of the cyberspatial techno-utopia boils down to the following assertions:

1. the brain functions like a computer and, conversely, the computer functions (and “thinks”) like a brain. Both ideas stem from a unitary theory concerned with the connection of networked elements: the brain is a network of neurons and the computer is comprised of networked chips;
2. with the Internet, a global network of networks is developing through the connection of the computers comprising it;
3. as a result, it is possible to link up human brains and computers through hyper-networks connected on a global scale. This affords the possibility of human-machine hybridization and “collective intelligence” in and through cyberspace. The construction of cyberspace relies on three assumptions: the network understood as a generalized interconnection, the existence of isolatable elements that are both different and similar, that is to say, brains and computers, waiting to be networked together, and lastly the human-machine hybridization, due to the brain-network-computer equation. In fact, the connectionist models legitimate this analogy. As Bechtel and Abrahamsen emphasized, “the initial impetus for developing network models of cognitive performance was the recognition that the brain is a network” (2002). Once these preconditions have been set, implicitly based on the markers of the reticular techno-utopia, cyberspace produces all the “beneficial” effects that “retiologists” are forever promising us. The main virtue of cyberspace is that it dissolves all disturbing elements – territory, institutions, particularly the State, and the physical body – and favors a quasi-religious asceticism regarding spirituality, enabled by the technical network of the Internet. Kevin Kelly, former editor-in-chief of *Wired*, the cult magazine for Internet users, thus described his first visit on the Internet as a “religious experience” (quoted by Dery 1996: 47). In 1992, John Barlow, founder of the *Electronic Frontier Foundation*, wrote that “The idea of connecting every mind to every other mind in full-duplex broadband is one which, for a hippie mystic like me, has clear theological implications” (quoted by Flichy 2002: 111). Cyberspace rearticulates the religious order and inserts it into technologies. In a sense it is the limit of reticular thinking, in its spiritual version. The establishment of cyberspace as an unlimited space for informational networks affords unrestricted movement in a pure space that is free of friction, ethereal and virtual. By way of exorcism, everything becomes possible in this ideational-ideal space, once territory has been forgotten. Jeremy Rifkin thus asserted that “The shift (...) from geography to cyberspace represents one of the great changes in human organization”, even referring to “migration of territory to cyberspace” (Rifkin 2000: 17), for in cyberspace borders disappear, as does physical territory... The physical body also becomes superfluous, as only the brain is

engaged in the cyberspatial adventure. In the fiction of William Gibson, who in 1983 created the term “cyberspace” in his founding novel *Neuromancer* (Gibson 2011 [1983]) it is all about “neuroconnection”. His definition of cyberspace is built on reticular imagery and... connectionist network architectures: it is a “consensual hallucination experienced daily by billions of legitimate operators, in every nation (...). A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity”. The hero Case, a hacker on the run, connects with cyberspace through a neurological interface, by plugging his nervous system into “the matrix”, a global virtual reality where information is stored in the form of tangible illusions. Case lived “for the bodiless exultation of cyberspace”, “jacked into a custom cyberspace deck that projected his disembodied consciousness into the consensual hallucination that was the matrix”. In other words, Case experienced disembodiment – “the body was meat” – and was able to leave his body to journey in the cyberspatial yonder, guided by the ghost of a dead computer hacker, synthesized by a computer. Gibson imagined Case’s brain and nervous system connected to the electronic network, cyberspace: the brain is externalized (into a computer – artificial brain), then connected. This interworld between technique and the body, between brain and network, is where the theme of the “wirehead” emerged. In *Schismatrix*, Bruce Sterling called the mechanists with prostheses who were connected via a computer “wireheads”, and in cyberpunk circles the term was synonymous with “aspiring cyborg”, since the cyborg is the connection of the individual brain to the global artificial brain (Dery 1996: 354, note 179). Meanwhile, the editor-in-chief of the journal *Mondo 2000* declared: “I think we’re going through a process of information linkup toward the building of a global nervous system, a global brain” (quoted by Dery 1996: 47).

In the cyberspatial interworld, the technicized bodies and naturalized techniques are merged into a single term and into hybrid beings that resemble technical fictions. What makes the unity of cyberspace, if not the idea of “interconnection” with reference to communication networks, encapsulated in Joël de Rosnay’s definition of the term: “cyberspace [is an] electronic space-time created by the emergence of communications networks and multimedia computer interconnections”? (de Rosnay 2000: 283). Cyberspace is a space of mechanical and organic networks interlinked ad infinitum, without borders. Pierre Lévy confirmed this reduction of cyberspace to the “network”, then to the vague idea of interconnection: “Cyberspace (also known as the ‘network’) is the new medium of communications that arose through the global interconnection of computers... One of the ideas, or rather one of the strongest forces behind the development of cyberspace, is that of interconnectivity... Interconnectivity weaves a universal through contact” (Lévy 2001: xvi and 107–108). For the *retiologist*, interconnection ultimately amounts to the intuition of a “sensation of all-encompassing space”. This sensation is strangely reminiscent of the “communion”, as understood in its etymological and religious sense, as sharing or pooling. In cyberspace, rough and resistant territory is erased; only a smooth, fluid space remains that is made for circulation, a space of

informational networks and links, without memory or places. This “space of space” of extended networks is hybrid, half-human half-machine. It indiscriminately connects humans and machines, as networks are sometimes brains and sometimes artefacts. Reticular fiction thus merges the technical and the biological into a seamless whole. Cyberspace is a hybrid being, but one that is “alive”, as *retiologists* assure us. In this respect, postmodern philosopher Manuel de Landa wrote: “Past a certain threshold of connectivity, the membrane which computer networks are creating over the surface of the planet begins to ‘come to life’. Independent software [programs] will soon begin to constitute even more complex computational societies in which [programs] trade with one another, bid and compete for resources, seed and spawn processes spontaneously, and so on” (quoted by Dery 1996: 44). Meanwhile Pierre Lévy declared that “cyberspace is similar to certain ecological systems”; “Its center will be everywhere, and its circumference nowhere. This hypertext computer will be dispersed, living, pullulating, incomplete: cyberspace itself” (2001: 93 and 26). Likewise, Joël de Rosnay’s cybion is “A hybrid biological, mechanical, and electronic super-organism that includes humans, machines, networks, and societies” (2000: 132).

Cyberspace is a powerful symbolic dissolver – a “consensual hallucination” –, as it eliminates all sources of resistance: the territory, the body, but also politics and the State. Thanks to the network, democracy will be electronic and “the political will disappear”, Jacques Attali announced.¹⁹ Through the generalized liquefaction brought about by cyberspace, the political and its state-national form can be eliminated. Manuel Castells declared that “networks destroy state control over society and the economy. What is over, at this current stage, is the Sovereign, national State”.²⁰ As early as 1979, Jean-François Lyotard announced that “The ideology of communicational ‘transparency’, which goes hand in hand with the commercialization of knowledge, will begin to perceive the State as a factor of opacity and ‘noise’” (1979: 15–16). This liberal-libertarian anti-state vision, inherent to web surfers’ ideology, merely updates the Proudhonian marker of the reticular techno-utopia. The network, considered to be anti-hierarchical “in essence”, becomes synonymous with self-regulation and equality. That is why the *Internaut* (web surfer) is meant to fight for freedom against all regulatory organs, against the dominant players (Microsoft, Google or the FBI, for example), for equality against all hierarchies, starting with those of States, and for the global fraternity of “virtual communities”. Freedom, equality and fraternity: the social utopia of 89 (1789–1989) is said to finally be here, thanks to the technical reticular utopia. As Pierre Lévy put it: “Cyberspace appears as a kind of technical materialization of modern ideals” (2001: 230). Certain evangelists of the “New Age” have found the same virtues in the network. Marilyn Ferguson writes that the network is “the antidote to alienation. It generates power enough to remake society. It offers

¹⁹Jacques Attali, *Libération*, 12 June 1998.

²⁰Conversation with Jacques Attali in the “Multimédia” supplement of the newspaper *Libération*, 12 June 1998.

the individual emotional, intellectual, spiritual, and economic support. It is an invisible home, a powerful means of altering the course of institutions, especially government. The Aquarian Conspiracy is (...) a network of many networks aimed at social transformation" (Ferguson 1987: 213).

Derrick de Kerckhove also celebrated the "connected intelligence" and saw "the essence of any network" (2000: 18) in webitude or the "mental bond between people", for the Internet "gives us access to a live, quasi-organic environment of millions of human intelligences". Kerckhove explicitly supports a biotechnological vision of the network, merging technical and biological networks: "continuity between the two domains, the technological and the biological, is established by the fact that there is electricity both inside and outside the body" (ibid.: 196). The author reveals the value of the organic model for *retiology*: the concern is to provide the unity, regulation and social totality of integration that gives substance to technology. "With the appearance of the Internet integrated on the scene, it is as though technology discovered a way of imitating the physical, biological body in the social, technological domain: each party is connected to all the others to ensure the integrated functioning of the whole" (ibid.: 200). In particular, Derrick de Kerckhove provided a key to decipher *retiology* when he wrote that "One of the main effects of digitization is to make 'liquid' everything that is solid" (ibid.: 196). Digitization into bits of information has allowed *retiology* to atomize the real and transform it into a fluid that circulates within networks. According to Kerckhove, the ultimate stage of this liquefaction is the transmutation of these bits into thought: "This very flexibility makes matter, once perceived as consisting of mutually heterogeneous and impenetrable substances, seem now as fluid as thought itself (...). The spirits on the Net are connected and do behave like liquid crystal in stable though fluid formations" (ibid.: 205). Beyond the "digital man" so dear to Nicolas Negroponte, the "digitization of bodies" is at play. With the cumbersome and imperfect body liquefied or reduced to a digital bank, comes forth "Homo silicium", to use David Le Breton's expression (1999: 201). In fact, cyber-liquefaction leads to liquidation of the body, purely and simply, that is, according to Yves Stourdzé, to "corporal extermination" (1998: 142). But internet *retiology* can be pushed to the point of technico-spiritualist delirium: Jean Houston, a philosopher and historian of culture who co-runs the *Foundation for Mind Research* in New York, claimed that "if the Internet is a product of divine creativity, even as we humans are, perhaps in some sense, it is a new life form, a silicon-based living being which may be one of our evolutionary descendants. And yet, the very biology of its biosystem is mystical in nature – a vast, nonlinear reality wherein, like Indra's Net, each node connects to every other. Its webbed world encompasses the accouterments traditionally assigned to the Mind of the Maker – circles, nets, infinite feedback loops, the endless flow of being and becoming, God's identity as that perfect sphere whose center is everywhere and whose circumference is nowhere. Add to this the Net's ever-unfolding pattern of novelty, and we have a living system, one which reflects the nature of life in all its iterations" (Houston 2000). Although *retiology* reaches its extreme form here, with techno-devotion as the mystical delirium of the network, it can also take on more rational forms, still however relying on the fetishism of the

Internet, to herald a social revolution. While the Internet fluidifies the social and bodies, through generalized digitization in cyberspace, it also recomposes links in a fragmented society that it networks, according to Manuel Castells. Digitization and fragmentation are the preconditions for intervention by the reticular prosthetics that reweave “spiritual” links in cyberspace, and “material” ones in the “network society”. Castells argues that it is not so much a matter of fluidifying society and the territory – as in cyberculture, which nevertheless remains a reference in his demonstration –, as thinking about social change, announcing the transition between a society in crisis, under “financial capitalism”, and a new society, under the networked “informational capitalism”.

Manuel Castells’ Network Society

In *The Rise of the Network Society*, the first volume of his trilogy titled *The Information Age*, Castells presented a vast synthesis of the techno-utopia and the reticular technology of the spirit in the Internet age. He thus provided a comprehensive retiological survey. Starting with the “Internet revolution”, he drew on the full range of markers of the reticular techno-utopia and used an elastic notion of the network that took on no less than twenty meanings before completely emptying itself out in a final definition of “interconnection”, shared with cyberculture. Yet the notion of “network” is crucial to his entire demonstration, which is based on the axiom of “the pre-eminence of social morphology over social action” (Castells 2010 [1996]: 500). The notion of network – of which the Internet is a “pure” example – is presented as the determining structure of society: “The convergence of social evolution and information technologies has created a new material basis for the performance of activities throughout the social structure. This material basis, built in networks, earmarks dominant social processes, thus shaping social structure itself” (ibid.: 502). If the network was removed (like “pulling the rug from under his feet”), his argument would collapse. Castells’ articulation of the network stems from retiological belief and epistemological fuzziness. The author begins with the following statement: “A technological revolution, centered around information technologies, began to reshape, at accelerated pace, the material basis of society” (ibid.: 1). Castells is concerned with the Internet and interconnected computer networks: “Interactive computer networks are growing exponentially, creating new forms and channels of communication, shaping life and being shaped by life at the same time. Social changes are as dramatic as the technological and economic processes of transformation” (ibid.: 2). The paradigm of the network is obviously the Internet: “The Internet is the backbone of global computer-mediated communication”. It is even THE archetypical network, for it is the “network of networks” (ibid.: 375 and 383 respectively). This McLuhanian or even Neo-Marxist statement – the technical revolution affects society through its material structures – is but a repeat of the first Saint-Simonian marker of the techno-utopia, which is that the network heralds a technical and social revolution. The Internet network ensures the

shift from technical change to social transformation. Castells actually later dedicated a book to “the Internet Galaxy”, with an explicitly McLuhanian title, in which he argued that “The Internet is the technological basis for the organization form of the Information Age: the network” (Castells 2001). He drew on this fetishism of reticular technique as an argument: “The story of the creation and development of the Internet is one of an extraordinary human adventure”, he wrote in *The Internet Galaxy*, in which he frequently used the adjective “extraordinary” to describe the Internet which, he added, “is indeed a technology of freedom” (2001: 1, 9 and 275 respectively). This approach, which affirms the existence of a base and technical infrastructure supporting the whole social fabric, is driven by a mechanistic vision: “The Internet provides the material basis for these movements to engage in the production of a new society” (ibid.: 143). Castells aptly summarizes the scope he attributes to the Internet, that is to say, the generalized networking of society, power and organizations: “The Internet (...) is not just a technology. It is the technological tool and organization form that distributes information power, knowledge generation, and networking capacity in all realms of activity” (ibid. 269). The Internet captures the whole social realm in its nets, the Web redefines the social fabric, as the railway or electricity once did. The Internet network is both the invisible social link (its hidden material structure) and the subject of the digital “revolution”. The author refrains from any technical determinism, though he does state that his starting point is “the process of revolutionary technological change” (Castells 2010 [1996]: 4) and that “technology does not determine society. Nor does society script the course of technological change” (ibid.: 5). He observes a complex set of interactions. Despite this denial, Castells’ reasoning is still underpinned by technological determinism: the technological revolution is that of IT networks. However, since the material basis of society is comprised of technological networks, society enters a revolution that constitutes the “general overhauling of the capitalist system” (ibid.: 2). Articulating all these Saint-Simonian markers of the reticular techno-utopia, Castells heralded a plethora of changes, as the mechanical consequences of the “effects” of the network defined as the material and cultural structure of the “informational capitalism” that he saw emerging. Castells’ “informational capitalism” pursues the ideas of Alain Touraine (who prefaced the translation of Castells into French) and Daniel Bell on post-industrial society, and re-examines the idea of the information society, in the Internet era. He describes this “informational capitalism” as the combination of a mode of production – financial capitalism – and a mode of development linked to the Internet. Based on this technical-economic paradigm, he sees a “new society emerging from this process of change [that] is both capitalist and informational” (ibid.: 13). Wary of veering into futurology, Castells nevertheless uses the technical network’s capacity to present itself as a transition towards an information society to come: the network society “emerging as a transitional form toward the informational mode of development that is likely to characterize the coming decades” (ibid.: 78). He characterizes the information society in terms of social fragmentation, the “general destructuring of organizations”, and the isolation of individualities; the social link could (and should?) consequently be reconstructed using technical reticular

prosthetics. Castells posits the prior atomization of the social before heralding its salutary “networking”. The new weaving of the social fabric is operated by the Internet: “The novelty is networking through the Internet” (2001: 176). The demonstration is based on the constitutive social atomization/technical network duo. The image of the network is the reverse of that of the demise and fragmentation of society: “we observe (...) throughout the world, (...) the increasing distance between globalization and identity, between the Net and the self”, Castells wrote (2010 [1996]: 22). To support his assertion of the network’s superiority over social atomization, Castells simply cites Kevin Kelly (ibid.: 70),²¹ one of the popes of cyberculture, who stated: “The Atom is the past. The symbol of science for the next century is the dynamic Net. . . Whereas the Atom represents clean simplicity, the Net channels the messy power of complexity. . . The only organization capable of non prejudiced growth, or unguided learning is a network. (...) Indeed, the network is the least structured organization that can be said to have any structure at all. . . In fact, a plurality of truly divergent components can only remain coherent in a network. No other arrangement – chain, pyramid, tree, circle, hub – can contain true diversity working as a whole”. Castells’ socio-economic demonstration also draws arguments from cyberculture and its fictions, as the two share a belief in *retiology*. Castells explicitly supports cyberculture as a suitable culture for the organization of the network enterprise, the cornerstone of this new capitalism: “there is indeed a common cultural code in the diverse workings of the network enterprise. (...) It is a *multi-faceted, virtual culture*, as in the visual experiences created by computers in cyberspace by rearranging reality. It is not a fantasy, it is a material force” (2010 [1996]: 214).

Since the notion of network is the cornerstone of Castells’ reasoning, one might expect a rigorous definition. Yet it is limited to the following, provided in the conclusion of the book *The Rise of the Network Society*: “A network is a set of interconnected nodes. A node is the point at which a curve intersects itself. What a node is, concretely speaking, depends on the kind of concrete networks of which we speak” (ibid.: 501). The same definition is used again on the cover of *The Internet Galaxy*: “A network is a set of interconnected nodes” (Castells 2001: 9). This minimalist definition of the network, reduced to a function of interconnection, is so weak as to be applicable to any object whatsoever. Only the connection remains. Castells thus multiplies the uses of the word network, which takes on no less than twenty different meanings in *The Rise of the Network Society*, securing the unity of the analysis through shifts in meaning. Just as Diderot’s *Encyclopaedia* observed “network effects” everywhere in nature, so Castells notes the generalized networking of the social, thanks to reticular techniques.

There is no better way of illustrating the deterioration of a concept into a technology of the spirit than through this enumeration intended to support the techno-utopia of the Internet revolution, which has become “the lever for the transition to a new form of society – the network society – and with it to a new

²¹ Manuel Castells’ citation is in a note (2010 [1996]: 70, note 87). See Kelly (1995).

economy” (ibid.: 2). According to the Saint-Simonian antiphony, the new technical network is fetishized as bringing social change: “Presence or absence in the network and the dynamics of each network *vis-à-vis* others are critical sources of domination and change in (...) the network society” (2010 [1996]: 500).

Castells’ generalized networking of the social in response to its prior atomization echoes the generalized fluidification of the social – “the liquid society” – imagined by cyberculture, thanks to numeric digitization. The present society, scattered and fragmented, can be regenerated thanks to the network, either through generalized fluidification, or through reconstruction in a new social fabric. The reticular technoutopia is always transformative, but in two different modes that define the network’s “double body”: the passage-transition from one state to another, or the continual passage-flow and movement.

Conclusion

Retiology is prevailing as a contemporary ideology, thanks to technical determinism. George Balandier was right to note that “everything seems to converge towards the most complete realization of the Saint-Simonian prophecy: to replace the government of people with the administration of chattel and the Organization” (2001: 254). However, this realization of Saint-Simonian *New Christianity*²² is far more of an administration of chattel turned government of people.

Drawing on the markers of reticular fiction, *retiology* is forever heralding the future (or “post”) society already at play in the construction of technical networks and the *imaginaire* they convey. It constitutes a set of discourses and imagery, or “theorized practices” of networks and even claims to constitute a discipline. Moreover, it already has its “*retilogists*” and has taken on the task of defining this transition towards the promised future, which is said to follow two main paths: either through the fluidification and generalized digitization of the social whole, for example in cyberspace, or through global reweaving, for example in Castells’ “network society”. These two facets of *retiology* suggest the restoration of the social link through the binding and regenerating virtues of technical networks. The world will either be fluid and liquid (Zygmunt Bauman), or a “feudalization of networks” (Pierre Legendre).

Contemporary *retiology* recycles and carries into the future an old imagery of the reticulated, burdened with a long history. It produces and reproduces old futures. The fetishized figure of the network, the object of its “new techno-devotion” (Balandier 2001: 34) always relates to a shift, in two main ways: the transition towards another state to come, or immediate motion. The network alternately refers to a future society rewoven by networks, or to movement per se, within which

²²Title of Henri Saint-Simon’s last book, 1825. See *Œuvres complètes* by Henri Saint-Simon (Grange et al. 2012, vol. 4).

individuals and society are constantly steeped. *Retiology* thus articulates two forms of transition understood as a crossing towards a new state or in immediate immersion in flows. Jean Baudrillard thus observed that “We are networked, we are the network. (...) We are steeped in it. Our present merges in with the flows of images and signs. (...) We are in real time”.²³ The movement is continuous. There is no longer any need to bring about social change; it is constantly experienced through the connection or “plugging into” the networks. This “post-modern” staging of transition is thus experienced in the practices and rites of places of transition and communication, which Marc Augé called “non-places”: doors and access keys, security doors, security gates or connection gates, to manage the daily ceremonies of entrances-exits in networks.

To enchant the generalized embrace of bodies, cities, society and the entire planet by technical energy, transport and communication networks, contemporary *retiology* celebrates the achievement of techno-utopia in the daily practices of circulation in networks and of connection to networks. It thus interlinks discourses and images of the reticulated to account for the contemporary “social fabric” and legitimate industrial propaganda in favor of the development of technical networks.

Retiology is an ideology with utopian aspirations, which is limited to the fetishism of technical networks, particularly the Internet. Whether it be literary fiction, futurology or socio-economic analysis of the “network society”, *retiology* is constantly heralding socio-technical “revolutions”. It thereby relieves social and political utopias of their heavy burden by transferring it to the technological utopia, which has the advantage of always materializing.

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²³Interview in the newspaper *Le Monde* 2, 28 May 2005.

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