Myths, symbols, society and nuclear energy

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Abstract: Today, can we really ascertain whether Humanity has effectively derived more good than evil from the discovery of radioactivity a century ago? The answer hinges on the judgement that we and our fellow-citizens make about the impact of the applications of nuclear physics, by reference to a number of fundamental values: the concern to preserve our planet, its inhabitants and its environment; the need to avoid the risk of conflicts; and the guideline of the development of all peoples. At the collective level, an ethic must enable every social group, every nation and, perhaps, humanity, to form a community of behaviours. This places us at the very heart of the nuclear debate.

Keywords: myths; fears; symbols; Hiroshima; Chernobyl; Fukushima; socio-political objections; psychological objections; psychological attitudes; behaviours and radioactivity; universe of representations; communication policy.


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1 The image of the atom

The implementation of nuclear energy, like that of any modern technology, incurs risks. Is nuclear power acceptable? Many people ask themselves this question, as we periodically observe through the debates that it inspires in the media.

The benefit that our fellow citizens expect from nuclear power is to furnish part of the energy required for the development of the people of the planet. Is this benefit tangible in view of the repercussions of a ‘nuclear accident’ or, conversely, of an energy deficiency? Few of us have actually experienced these events, and yet everyone has his own opinion, after having weighed the pros and the cons of the hypothetical situation. What mechanisms govern the formation of these opinions?
1.1 Founding traumas

Nuclear energy was revealed to the public at large by the bombs of Hiroshima and Nagasaki. This image was revisited by the accident of the Soviet power plant in Chernobyl, and then by the unsubstantiated media circus stirred by Fukushima.

A few kilograms of material in a single device dropped on Hiroshima by a single aircraft, the Enola Gay, had an impact as murderous as the thousands of tons of incendiary bombs dropped on Dresden. The technological exploit, combined with the moral trauma caused by a deliberate decision, contributed to turn Hiroshima into the founding trauma of this dread of the nuclear weapon, whereas the far more devastating tragedy of Dresden has vanished from the collective consciousness.

The combination of technical failures and human errors inherent in the Soviet management system caused the explosion of the Chernobyl power plant reactor No. 4. This nuclear accident, technologically less serious than that of Three Mile Island, nevertheless became the founding myth of the fear of nuclear power of which Fukushima was the heir.

Hiroshima, death decreed, thus stands against Chernobyl, death suffered, whereas at Fukushima, death is absent. The two faces of the nuclear Janus pervert the reality of Fukushima to turn it also into a drama. This will very probably always be the case whenever an incident, however trivial, occurs in a nuclear facility.

1.1.1 Hiroshima: ‘Sun of Death’

The sun of death over Hiroshima: on 6 August 1945, at 8 h 15 min 30 s, a uranium bomb with a power of 12.5 kT filled the azure sky. Observing scientists saw the sky ignite. Half of the victims were killed by the mechanical impact of the explosion, 35% by the heat emissions, and 15% by the radioactivity, making 140,000 dead and 400,000 people irradiated. The incandescent bomb disintegrated into a sun 280 m in diameter, six times brighter than the sun itself. It radiated heat that burned everything within a radius of 3 km. The physiological symptoms appeared in the very first seconds after the explosion, and persisted through the decades that followed.

In the case of Hiroshima, we inhabit a world of historically proven facts. Everything is true, confirmed. The issue was one of military nuclear power used for warlike purposes. Yet public opinion, from the expression ‘military nuclear’, only retained the noun ‘nuclear’ which it shared with ‘civilian nuclear’ or nuclear energy, that is to say, the exploitation of the fission or fusion of the atom as a source of energy. When the media or an individual addresses the theme of ‘civilian nuclear’, Mr. ‘Everybody’ only hears the word ‘Nuclear’, which for him means 400,000 victims, physical and psychological symptoms, images of war.

This confusion by association of ideas, indeed the association of concepts, has two origins: the first is historic. Hiroshima and Nagasaki are the first two genuine planetary and public manifestations of the use of nuclear power. Not even the discovery of radioactivity, the NOBEL prizes, the race to develop a nuclear weapon, had this echo; they remained confined to scientific circles and had little impact on the public.

The second source is due to the scale of the tragedy. The context of the Second World War, the number of civilian victims, the resources employed …combine to make of Hiroshima the starting point of the nuclear adventure in the popular consciousness, whereas the bombing of Dresden, virtually forgotten by the public at large, no longer
elicits any response, even though the number of deaths and the devastation caused were
greater, and although this German city had no strategic importance. The bombing of
Dresden is clearly a case of a crime against humanity. In the case of Hiroshima and
Nagasaki, the jury is still out. There is no doubt that instead of the bombing of Hiroshima
and Nagasaki, several smaller bombings of military targets would not have had the same
repercussions, or not the same influence, on public opinion. We could even consider that
if the US leaders had merely made a technical demonstration of their weapon, capable of
ending the war, the conscious or unconscious reference from nuclear to military nuclear
would not be so systematic.

This is not a matter of rewriting history, of deprecating or approving a 70-year old
decision, but rather of analysing the popular amalgam between ‘civilian nuclear’, a
source of energy and hence of wellbeing, and ‘military nuclear’; a verbal amalgam due to
the single common denominator, the term ‘nuclear’ harking back to the historic concepts
of Hiroshima and Nagasaki.

1.1.2 Chernobyl: ‘Cloud of the Apocalypse’

Chernobyl is not the worst nuclear accident to have occurred. Three Mile Island in the
USA was technologically worse. But in the context of the Cold War that prevailed at the
time, the media reverberation that the USA hastened to give this accident, in order to
discredit its enemy on the only issue, technology, in which the USSR could still claim to
be its rival, was so thunderous that the collective consciousness of the entire planet was
inundated by a propaganda campaign based on a very palpable reality, which the Soviets
committed the fatal error of trying to conceal. Suddenly, there was a before and an after
Chernobyl in the history of nuclear energy. Twenty-five years after the event, and
although the real health, biological and environmental balance is far lighter than what the
media announced, the rumours associated with this accident contribute to sustain the
myth of Chernobyl, illustrating man’s helplessness before a science that he does not
completely control, and confers its full meaning to Rabelais’ aphorism whereby ‘science
without conscience is nothing but the ruin of the soul’. On 26 April 1986, the
professional conscience was absent from the minds of the director of Chernobyl and of
many of his subordinates.

The initial government mendacity definitively discredited all the news coming from
official sources. On the nuclear issue, Mr. Everybody no longer believed the ‘official’
statements, whether made by the government, by its representatives, or by government
departments and bodies.

It seems important to stress the unity of time (the test of April 1996), the unity of
place (Chernobyl power plant) and the unity of players (the operators on the spot and the
government leaders) which gave the Chernobyl accident the scale of an ancient drama,
with its accursed cortege: public opinion does not condemn the automotive industry for
the least accident; for the nuclear issue, everything is obviously different.

Chernobyl has ascended from the level of an accident to that of myth, myth being
declared as the representation of real events, distorted or magnified by the collective
imagination. If we ask a hundred persons to identify the theatre of a nuclear accident, not
only will the hundred unhesitatingly name Chernobyl, but an overwhelming majority will
be incapable of listing any others, although historical perspective or problems of
memorisation and faulty recollections are not the cause (Windscale in 1957, then Three
Mile Island in 1979 and now Fukushima). Chernobyl injected something new to the
popular mind.
Chernobyl ‘benefited’ – so to speak – from the huge propaganda apparatus of the USA, delighted with the chance to discredit its Cold War adversary definitively: the fall of the Berlin wall three years later is a consequence of Chernobyl. Chernobyl symbolises the failure of the ‘new alchemist’, it falls into the tradition of the ‘great fears of the West’, to resume the expression of the historian Jean Delumeau. It inspired government mendacity in the USSR. And it let loose constant references to Hiroshima and to the Black Death, contamination being assimilated with contagion.

With Chernobyl, and contrary to the case of Hiroshima half a century earlier, we swim in an ocean of symbols, sometimes bumping into islands which embody the few concrete bits of information that reach us. Obviously, the scientists have succeeded in calming the nuclear demon and enchaining it in their reactors. But can we be so sure that it will not escape? Does not Chernobyl prove that it has not been securely encaged?

Public opinion quite naturally slides from the register of reason, which sets limits to the behaviour and responses after such events, to the realm of emotion. In this respect, Chernobyl falls in to the great tradition of the vast human disasters symbolised by the plague and cholera epidemics, while displaying specific features that make the disaster radically new in comparison with its predecessors (lack of an antidote, technological character). Like all the great myths which inspire fear, Chernobyl provokes and engenders abnormal behaviour. There was contamination, an unfortunate term that strikes the imagination though far removed from any pandemic reality. Through fear of the ‘other’, people avoid each other, fearing mutual contamination, doctors avoid touching the ‘infected’, and priests provide absolution at arm’s length. The paroxysm of this fear is the abolition of personalised death.

Chernobyl draws its technological resources from the military explosion over Hiroshima, but is even more deeply anchored in the collective memory if one seeks physical and organic references. And yet neither the endemic nature nor the characteristics of the symptoms are comparable in the two cases. What Delumeau writes of the plague applies to Chernobyl, but not to Hiroshima: ‘By destructuring the everyday environment and closing the door to the future, the plague thus doubly shook the foundations of the psyche, both individual and collective’. The loss of these psychic landmarks forced the local population to find other concrete references, other foundations. Perhaps not the most fitting, the most meaningful, but certainly the most pregnant, the one that most incisively marked its age.

The scenarios of the great myths all have a Manichean nature; Chernobyl stigmatised a band of heroes in the persons of the firemen of Pripyat, ordered to dump 5000 tons of materials on the reactor to build the sarcophagus, and the power plant employees. This heroic label has a particular cogency in the country of Tolstoy and the battle of Stalingrad: defence of the nation, sacred cause. And most of these heroes gave their lives to circumscribe the impact of the accident. All are identified by an outstanding act. On the contrary, the cowards, the rascals are the statesmen who failed to alert the populations of the dangers they ran, who precipitated the accident by faulty management of the nuclear heritage, dispatching firemen ‘to the front’ to repair what was still reparable. The groundwork of the great myths pitting Good against Evil was laid; the imagination blossomed in the midst of the events.
The harrowing episode of the ‘Chernobyl Cloud’ is undoubtedly the perfect illustration of the capacity of the media to harm. The claim that the ‘Chernobyl cloud’ stopped at the borders of France was attributed to Professor Pierre Pellerin, director of the Central Service for Protection against Ionising Radiation (SCPRI). The ludicrousness of this assertion instantly discredited all the statements, all the declarations, all the studies and analyses that the authorities subsequently presented. The statement even became, in the popular language, the stereotype of the lie that is so big that no one can believe it. In actual fact, it was not Professor Pellerin who made this declaration on French television, but the anchorman, the journalist Jean Claude Bourret, and only in jest! But since then, the ‘Chernobyl cloud’ has slipped into the collective unconscious as evidence of state mendacity. It henceforth became impossible for Mr. Everybody to assign any credit whatsoever to the authorities in nuclear matters.

The symbols are ineluctably present to reinforce this contemporary myth. In describing the plague epidemics, Delumeau uses three explanations which are similarly apt for the Soviet accident:

1. The scientists, the new alchemists, are transported to the bench of the accused by the anonymous crowd: the first characteristic is therefore the popular accusation. Some even see therein a CIA plot, hatched by the man with the wine stain, ‘the demon marked on the skull’, Mr. Gorbachev;

2. The epidemic is transmitted through the air;

3. And the necessary divine reference, the punishment for all the sins of human kind, and the many consequences in the accounts: ‘sinners met amphibious fish (…), the newborn have yellow liquid in their veins…’. One goes beyond the reference to the plague epidemic to enter into the fabrication and invention inevitably condoned by the lack of clear official information, and the loss of the conventional psychic foundations.

The accident went from the status of secret to that of a state lie; the distinction holds because we go from the unsaid the open falsehood, because these lies come from the representatives of the state. In the USSR, the state lie occurs at all stages of the accident. It was first denied by Gorbachev and then dealt with anarchically and in disregard of human life. It is by implicating the highest circles that the accident became a myth: even the supreme leaders were implicated in a campaign perceived as mendacious, even though the initial lie was told by the director of Chernobyl. In reply to the question asked at the outset of the drama by the Russian experts still in Moscow: “has the reactor exploded?”, Viktor Briukhanov, the director, answered “no”, thereby directing subsequent decisions into a blind alley and setting in motion the abominable mechanism of the state lie.

The myth of Chernobyl was tacked on to the initial myths of Hiroshima and Nagasaki, not because of any confusion between civil and military nuclear, but because the disaster struck a civilian infrastructure. But other factors are also at play: amalgam with other notable events, creation of a myth and lack of information.

This lack of information, combined with mollifying statements, established sufficient leeway to allow the proliferation of interpretations at once contradictory, hermetic and incomprehensible, indeed apocalyptic, from the various sources. All of this made up the fertiliser that enabled the ecologist interpretations to spread on a social soil.
Hiroshima and Chernobyl are both symbols of atomic death, the first representing the given death, the second the received death, a reminder that the civilian atom can kill at any time, because added to the technical defects are the acts committed by human beings, deliberately or by mistake. A bad death, as opposed to death caused by the explosion, the light, the heat, guiding principles of the apocalypse. Henceforth, civilian nuclear energy would systematically be associated with the events at Chernobyl. An energy source for wellbeing was now assimilated with an apocalyptic scourge.

### 1.1.3 Fukushima

Fukushima ‘benefited’ from the Chernobyl myth as a catalyst of the combination of two attitudes towards the accident: the attitude of the media, greedy for the sensational, and that of the politicians, toeing the line of the ecologically correct to secure their re-election. Whereas the nuclear accident, controlled after several no doubt difficult days, did not cause a single death, and had no radiological and environmental impact, the irritating attitude of the media, immediately espoused by the vast majority of the politicians, created a global trauma. This vexatious attitude can be illustrated to the level of caricature by the deplorable attitude of Eveline Widmer-Schlumpf, the Swiss Federal Councillor.

A member of the Union Démocratique du Centre (UDC), a centre party considered to be close to the Far Right, Eveline Widmer-Schlumpf was only elected to the Federal Council in 2008 because the other parties had decided to bar the election of the UDC president, who should normally have been elected to the council under the democratic rule. During the Fukushima accident, Widmer-Schlumpf, in charge of energy at the time, proposed a moratorium on nuclear energy in Switzerland, even though a referendum had been scheduled on the issue in the following year. By this political contrivance, Widmer-Schlumpf expunged her sulphurous past at the UDC and elicited the sympathy of the Swiss Socialist Party and the Ecologists. Given the specificities of the Swiss electoral system, after having been re-elected locally and having resigned from the UDC, she merely needed to create her own party, the Bürgerlich-Demokratische Partei, to be re-elected in 2012 to the Federal Council with the support of the Socialists and the Ecologists! Characterised by the utmost perfidy, the reasoning developed by Widmer-Schlumpf to ratify the moratorium on nuclear energy was based, using the example of Fukushima, on the fear of a tsunami threatening to drown the Swiss nuclear power plants! One may rightly be astonished at the immense credulity of public opinion, which swallowed such an aberration, but it is crucial to emphasise the truly villainous role of the media fringe won over to the ecologist ‘cause’ and the sheepish touchiness of the Swiss political class, which made such efforts to mislead the nation.

### 2 Objections to nuclear power

#### 2.1 Psychological objections

Alongside the historic references of Hiroshima and, more recently, Chernobyl, the apprehensions of the mass public are perfectly understandable. The atom is mysterious; it touches the core of nature itself. The Greeks called it ‘αὐτόμος’, meaning ‘invisible’. Not only have we dissected it but we now shatter it in the core of the nuclear reactors, and its fragments remain anathematised for centuries to come.
This type of moral objection could stem from a virtually religious argument that nature has been violated to enter the realm of forbidden knowledge, so that human kind is exposed to the chastisement of the Lord of the Universe. The myth of Prometheus stealing fire from the Gods of Olympus revisited and transposed to our own time!

And yet radioactivity and fission are not human inventions, but on the contrary, the expression of the conversion of matter to energy, or of energy to matter, at the origin of the Universe. These reactions have occurred from earliest times, but only exist in people’s minds, for some since 1986 at Chernobyl, for others since 1945 and Hiroshima, or even 1943 and the creation of the first atomic reactors in the USA.

Yet despite their respectable age, nuclear processes remain incomprehensible to many people, sparking these psychological objections. This is even one of the basic reasons for their mistrust.

Communication has very often stopped at the gates of the research laboratories, arrested by the esoteric language that the scientists need to explain such a delicate subject. The argument has never been institutionalised, never democratised, never popularised by educational efforts. Not all scientific inventions need to escape this intellectual ivory tower to address the neophytes and the man in the street. But civil nuclear power is obliged to make this effort owing to the particular contacts that it maintains with its public.

Differences of opinion between scientists and specialists surprise and often disturb the public at large. Some consider nuclear power to be dangerous, others as perfectly secure and vital. The discord prevailing between these communities nourishes all the psychological objections of the public. The calamitous comedy of AREVA’s communication policy during the Lauvergeon decade is a good illustration of this. ‘Unconcerned, unconvinced’, the old refrain.

2.2 Socio-political objections

A number of questions can be asked: does nuclear power draw its justification from the pursuit of a consumer society; is it a source of conflict between states; is it leading to a new technological colonialism of the strong against the weak, to a police state?

These questions are legitimate, but their answers are perfectly clear, because moderated by an objective demonstration of the situation. This socio-political aspect is not directly concerned with our study, even though the proximity of the two objections (and no doubt their mutual influence) could be intensified. Hence this point is not addressed in our analysis.

2.3 Fear

Everyone talks about fear, or the notion of fear. This noun is seldom employed in the plural, and yet many fears exist, of different colours, different types, different manifestations and proportions. Their common feature is that they characterise a feeling, and emotion, that accompanies the awareness of a danger, of a threat.

There is talk of ‘fear of the Nuclear’, as the historian Jean Delumeau speaks of the ‘great fears of the West’ for the plaque epidemics. Louis Vincent Thomas recalls in ‘Le Sentiment De La Mort Nucléaire’\textsuperscript{2} that the three features underlying the fear of nuclear
energy are the smallness, invisibility, virtually limitless lifetime and ease of propagation of the nuclear element (atom or waste for public opinion). Are we not committing the sin of pride, a sacrilege, in trying to domesticate it?

The countervailing power of the small had already attracted the attention of the ancient philosophers. Lucretius, in De Natura Rerum, saw in the atom a means for doing away with the Gods assuming that the fact of doing away with a divine loophole is a favourable outcome for a society.

In fact, the fear of the military nuclear and the fear of nuclear energy, although issuing from the same atom, have different natures; they are clearly twinned by the Hiroshima episode and the resulting amalgam, but the similarity stops there. The fear of nuclear weapons, which are efficiently managed on the whole by the experts, resurfaces cyclically in civil society. The fear of nuclear energy, which is less rational, immediately emerges as an ever latent civic fear, as opposed to the fears of the experts.

2.3.1 Fear of military nuclear

The nuclear weapon is considered to be the ‘Absolute Weapon’. Robert Oppenheimer himself stated that “the way to use atomic weapons was set at Hiroshima. These are weapons of aggression, surprise and terror”.

These kinds of statements surely have many virtues, but certainly not the virtue of reassuring the population. On the contrary, the nuclear weapon has never been used on civilian targets since Nagasaki, apart from the underground, atmospheric and marine military tests. It is therefore considered by all, the armed forces, politicians, experts, scientists and public opinion, as a weapon of deterrence; even if some doubts have arisen to test this beautiful image and arouse some anxieties, particularly during the Cuban missile crisis and, nearer to us, the US antimissile shield which does not appear to make the Russians happy. It is possible to affirm that the idea of a weapon of deterrence is widely supported by the population.

Note that this fear of military nuclear energy is cyclic, in phase with the environment and the international political context; Pierre Hassner discusses the cyclic and discontinuous character of the public democratic debate in an apparent subterranean continuity: the philosophical debate has never been fully concluded and activity peaked sharply in the West in 1950 and 1975.

These two periods correspond to moments when public opinion doubted the deterrent reality of the nuclear arsenal of the nations.

The 1950 crisis saw a German religious-philosophical-scientific coalition. The German protestant church, by its Heidelberg declaration in 1959, Karl Jaspers and his book ‘The Atom Bomb and the Future of Mankind’, and finally, a handful of communist intellectuals and their Göttingen appeal, raised the question of the legitimacy of this weapon of deterrence, and of anyone’s claim to hold the ultimate authority in this area. At the time, the Stockholm appeal launched by the Congress of Partisans of Peace relayed the German initiative. The context in which this climate emerged was the US announcement of the research programme on the H Bomb, overtaking the Soviet Union in the military uses of the atom.

The 1975 crisis was even more deeply anchored in public opinion, which had trouble understanding how the proliferation of nuclear warheads, miniature precision shells, the concept of ‘flexible response’ or the technical innovations, tended towards peace. The
crisis of confidence between the experts and the citizens was deep, and different according to the cultures. Again, this surge of the sentiment of fear corresponded to an ad hoc political climate: the Euromissile crisis, oil shock, weapons proliferation.

Fear of the nuclear weapon certainly exists; this fact is undeniable. The million marchers in New York in 1982, and the 350,000 in Bonn in the same year, provide a numerical record. The federative character is also evidence of the reality of this fear. But it only exists because suggested and vectorised by an international political substrate. Without these strategic-military tremors, the civic sentiment of fear would have remained measured, marginal or even distant. The establishment of ecumenical and allegedly democratic debates failed to diminish this phenomenon, but enabled the arrogance of a few manipulative orators to substitute for pedagogical excellence.

It is possible that the idea of deterrence, which is still associated with debates on the nuclear weapon, tempers the sentiments that animate public opinion. With the exception of Germany, still reeling from Hitlerite ambitions, countries where this type of debate and socio-pacifist attitude occurs are historically the western countries, members of the very select club of owners of the weapon, where the socio-political contexts are relatively stable. Apart from an extremist fringe of the population, the idea of possessing the weapon without using it is rather reassuring. Quantitatively speaking, this aspect of the feeling of civic fear no longer prevails, today, in the majority of the population, even if the end of the Cold War may have done no more than shift this sentiment.

2.3.2 Fear of civilian nuclear energy, of nuclear power

From 1901, when Pierre and Marie Curie celebrated the virtues of radioactivity, until 1999, when Robert Boiteux, honorary chairman of EDF, vaunted the merits of nuclear energy, seldom has history witnessed such continuity in the unanimous support of the experts for a new technology. Public opinion, initially optimistic, then progressively eroded by doubt, has always been poorly accompanied in its fears. Why?

Genesis of fear: How did we go from the virtuous status to a negative image deeply anchored in the collective unconscious?

In 1934, Marie Curie, in her treatise on radioactivity, described all the virtues of her discovery, citing examples of medical therapy, the ingestion of natural or artificial radioactive water based on radon, venous ingestion, physiological serums, inhalations, powders, pills, etc. However, the public remained aware of the risks of this radiation: Pierre Curie suffered an ulcer of the arm for two months for having deliberately exposed his arm to the radiation. Rumours of genetic mutations, cancers and sterilisations, then made their appearance. The first known concrete facts emerged in 1954, when a Japanese fisherman accidentally died from the effects of the fallout of radioactive dust during US tests. The victims of Hiroshima found therein an echo to the events of 1945, the debate raged on, making headlines in the newspapers, and were globalised because of the American-Japanese involvement.

For the first time, facts were associated with the symbols, fantasies and representations which hitherto alone occupied the minds of the citizens. The image of radioactivity began to change, radiation no longer appeared to be harmless, mistrust grew. Is it conceivable that if the fisherman had not sailed out to fish on that particular day, the aura of radioactivity might have remained intact?

The first oil shock relayed these events. Nuclear power became a major political factor, even a societal challenge, from the events of May 1968, to the ecological
demonstrations, particularly the gathering on the outskirts of the Superphoenix power plant in Creys-Malville in July 1977, even though we know now that it was not at all spontaneous but organised and funded by Prince Sadruddin Aga Khan (La Tribune de Genève, 14 May 2003, declaration by Robert Cramer, Geneva state councillor). There was a plot against nuclear power, a plot that the nuclear industry and the authorities always refused to acknowledge, sure that the ostrich attitude was the best response.

In this way, nuclear power spread beyond the technical and scientific dimension to attain a geopolitical dimension with the Messmer programme for energy self-sufficiency, a social dimension with the appearance of the ecologist movements, a recycling of the belated 1968 movements. A civilian – an asthmatic – died accidentally during the clashes around the Superphoenix plant. The antinuclear movements immediately transformed him into a martyr of their ‘cause’, public opinion being ready to endorse this type of manipulation. Nuclear power went on to become the symbol of technology and science in opposition to society. To oppose nuclear power would now mean not only the rejection of the atom or the fear of a power plant in one’s garden, but also the fight against centralised power in all its complexity, against the military, industrial authority, against the destruction of nature and, beyond, the killing of the planet. For Alain Touraine, the fight against nuclear power henceforth incarnated the type of protest against the central power of ‘programmed’ societies; the aim was to ‘combat the false modernity embodied by the nuclear industry on behalf of a deeper modernisation’.

The 1980s then substantiated the promoters of nuclear energy: the second oil shock merely confirmed the need to develop this resource.

Chernobyl, whose psychological consequences have been described above, seemed at that time more to crystallise the issues of transparency and information, than the health impact of the accident. Unconsciously, the Soviet failure went on to credibilise the activities of the western countries. Today, the sentiment of fear is more measured in public opinion; it now only appears in a more disputatious fringe of the population. This does not mean that it has disappeared completely from the civic mind, but it no longer outcrops as much. A sort of cognitive iceberg that the emerged section of the ecologists reawakens during electoral sessions, by making the submerged majority aware of the existence of a sensitive fact. Since the waterline is so thin, it is not difficult to revive this sentiment of fear.

The instrument of fear: Few citizens are capable of identifying the source of information on nuclear safety, nor even of putting a name on the state bodies in charge of guaranteeing this safety. This is certainly emblematic of the confusion that persists when the public is to be informed. Nor is the ecological alternative more attractive, because it usually conveys extreme reactions.

We shall certainly not retrace the record of the entities that guarantee French nuclear safety. This is not our intention. We shall merely underscore the fog that surrounds the role of all the official and unofficial entities (CEA, DSIN, ISPAN, WANO, EURATOM, AIEA, WISE, CRIRAD), the activities of the official and unofficial ecologist movements, whether the actions of Greenpeace or the political machinations of the Europe Ecologie les Verts party (Greens) denounced by Daniel Cohen-Bendit, which do not propose real alternatives to state decisions.

The fear of civilian nuclear power therefore only appeared very late and suddenly, in the wake of the Chernobyl accident. It was revealed to the whole world, nourished by the relay provided by the ecologist movements, but above all, by the lack of independence of the control bodies and the communication deficit of the public nuclear operators. It is sustained more by perceptions than by reasoning.
Characteristics of this fear: Contrary to the fear of military nuclear energy, the fear of civilian nuclear power is not a cyclic sentiment that appears and then disappears, like an eclipse, in accordance with contemporary events. It feeds on the certainties of the experts and could mutate slowly into a ‘Great Fear’ if the barrier between the citizens and the players of the nuclear industry is not abolished.

1 A societal fear: Two aspects feed this fear in the man in the street. First, the fear of nuclear disorder, in other words, the absence of control of fissile materials and exports, of an activity which, to his mind, deserves the full regulatory and standardisation focus. The dismantling and breakup of the former Soviet Union do not mean regulatory intensification and enhanced controls in the public mind, but on the contrary, liberty and laxity. The states themselves are aware of this problem, and have initiated political and financial measures to keep civilian nuclear activity within regulatory limits. Yet these efforts are barely known to the public at large, which on the contrary, instantly accepts the alarming reportages of the leading television channels.

Fear has recently spread of nuclear terrorism, chiefly in the form of a savage attack on civilian infrastructures. It has been suggested that civilian nuclear power may no longer be a taboo for terrorists, whereas the real danger lies on the side of bacteriology.

2 Everyday fear: As opposed to these fears, everyday fear is based on purely technical issues.

All the published surveys show that the closer people live to a power plant, the more reliable they consider it. If they deny a risk, it is because they feel that all precautions have been observed, and that nothing is more intensely monitored than the nuclear industry. If so, what other risk is there? In the public mind, the safety of a power plant decreases in proportion to its distance.

These two parameters obviously have nothing in common, and we have to seek in the statements of neighbours, as reported in the media, the justification of this fear among those who are not faced with the same situation. ‘The plant, I can’t see it from where I live’, ‘If it ever explodes, the winds are often westerly, so I’m not worried’, ‘to die from that or from something else…’ are only some examples of the words ascribed to the neighbours of the power plants, and their reading justifies the analysis made hundreds of kilometres away by those who prefer to see an apparent insouciance trapped between fatalism and realism. Studies conducted by salon psychologists explain in great detail that people living in the immediate vicinity of nuclear power plants build up a set of defence strategies to convince themselves, and live a better live in a worrisome spot. For non-residents, a chronic everyday anxiety, the opposite of its military twin, appears much more acute. It sometimes triggers accusations of phoney realism among residents, who are felt to be ‘so intensely manipulated as to be totally blind to the dangers around them’. Hence, the need to defend them whether they like it or not. It so happens that the participants in anti-nuclear demonstrations all live hundreds of miles from a nuclear facility!

The state of the reactors, especially Soviet reactors, is rightly not a serious issue. Despite the abundant studies published in the media, no opinion trend is perceptible to demand the closure of reactors that have been declared obsolete, by anonymous
Doomsayers. This willful blindness is incomprehensible when seen against the hysteria that surrounds everything associated with waste and its transport, up until the Fukushima accident. The reversal of the public attitude was spectacular, with some political leaders surfing the wave to demand the closure of completely safe power plants, like the Swiss and German plants. It would seem however that this bubble of anxiety is about to burst, public opinion having identified another ecologist lie: the resumption of operations at power plants in Japan has dispelled the noisy accounts of the definitive suspension of the Japanese nuclear programme.

3 Metaphysical fear: No public debate has really taken place on waste treatment; this is not to be blamed on the technology surrounding the subject, which can be treated very simply, but on the nullity of the communication policies associated with these programmes. The waste problem is no longer a technical problem but a societal issue. It is the last bastion to be confiscated under the banner of the ivory tower and an esoteric nomenclature. It is quite natural to fear what one knows nothing about, or very little. Fear of the unknown confirms what was augured by the two previous fears: their latent, continuous and moderate nature:

- Radioactive wastes worry public opinion because of their danger and because of their longevity, which extends far beyond human experience or understanding. The fears are usually diffuse because the debate is confined to scientific circles, but generally concern the stability of the wastes over time, the rigorous monitoring of the containment and disposal facilities, the impermeability and stability of the geological strata of the host formation, in other words, questions of stability and continuity in the future. And here, the authorities are faced with a true dilemma: the laws and the national interest oblige them to communicate to the maximum, through a concern for democratic transparency. However, this information, travestied for inexplicable purposes, has exacerbated the public awareness of the dangers of the wastes and their timescales.

- The other concept in play is the reversibility of disposal, and more specifically, the burial depth of the waste; should it be buried deeply in old mines and quarries ‘till the end of time’, or at a measured depth, anticipating the likelihood of technological innovations improving the control of waste reprocessing in the future. This debate is slightly more exciting for public opinion, which is powerfully influenced by the ecological movements. Here also, the strategy pursued is antinomian with the consideration of the anxieties of the public at large, justified or not: ‘if these wastes are buried so deep’, thinks Mr. Everybody, ‘it is because they really are dangerous’!

Reactor safety, radioactive waste: these questions, inherent in the nuclear exercise, arouse fears to varying degrees, fears that the ecologically correct have qualified as civic. These fears are also quantitatively different: acute and cyclic for military nuclear, chronic and continuous for its civil pendant. It also seems that within the civil nuclear division itself, the scale of fear fluctuates: it seems to intensify if the subject becomes close and concrete (residential proximity, impact on descendants, etc.).

Yet even if the majority public opinion does not want to renounce civil nuclear power, the tradeoffs are unwieldy. The gap between the experts, who see fabulous scientific progress in nuclear energy, and the public, who see systemic failures and magnify them to the extreme, is inexorably widening.
2.4 The nuclear industry, ahead of its time?

From 1955 on, public opinion considered that nuclear energy was an extremely safe energy, certainly safer than hydropower, and certainly less dangerous than conventional coal. The public now wants to re-open the coal mines and rebuild conventional thermal power plants! Public opinion is demonstrating an extraordinary fear towards the development of nuclear energy for peaceful uses. 10

The association of civil nuclear energy with the events of Nagasaki and Hiroshima, and the accidents of Chernobyl and Fukushima, is a complicated matter. Even if Hiroshima, Nagasaki, Chernobyl and Fukushima had never happened, the same problems would arise, with the same irrational behaviour, out of all proportion to the reality of the facts, because this type of emotional behaviour is an extremely common phenomenon.

In 1957, the World Health Organization and observers were struck by the deep ambiguity and multifaceted ambivalence, cognitive and affective, evident in the reactions to Atomic Energy. At the outset, the nuclear industry and the problems of all kinds, human and technical, psychological and sociological, that it raised, had a truly annunciatory value. Because of the technical requirements that it imposed, the intensive automation, insulations outside urban districts, etc., but also because it instantly encourages a questioning of the benefits of technical progress, foreshadowing a fair number of developments and responses in western society, both urban and state. Beyond the specific psychological reagent that the nuclear industry stands for and its train of warlike memories, invisible radiation and hazardous challenges, the nuclear industry foreshadows the industry of tomorrow.

To embody at once the symbolism of the future, of anticipation, of expected technical progress and accidental death, is a very cumbersome and explosive combination.

The 1970s marked a turning point for the atomic industry, with the surge of the second wave of scepticism in western public opinion. Science and its representatives could not avoid being drawn into this current. ‘It attracted blame for its effects and uses, in a world that lived in constant terror, and tends to be so in itself. This leads to anti-scientific resistance, vagueness and deep-seated irrationalism’. 11 Ineluctable proof of this can be found in the scientific discourse in the nuclear debate, upon the end of the war, and in the ecological debate.

The public is learning about techniques and sciences via articles in the popular press which, having a more mercantile than educational objective, take considerable liberties with present-day scientific knowledge. Paper has to be sold! These years were strongly marked by mistrust and disenchantment. The public increasingly tends to mobilise outside conventional societal frameworks, to pose as the principal claim the defence of nature and the rejection of the single-purpose industrial society, exemplified in their eyes by the nuclear industry. Nature and nuclear thus became two antagonistic coercive concepts from then on, the second capable of destroying the first.

The resurgence of the ‘occult’ and esoteric preoccupations, as a counterculture characteristic of transition periods, and these claims tied to nature, are transparently false. They are the sign of a crisis of society. This “principled priority assigned to Nature, over Culture” according to Claude Lévi-Strauss, always reflects a period of crisis, of doubt, of transition and of mutation. The return to reassuring values, to bountiful ‘nature’, mother and provider, as opposed to nuclear, is the result of the massive rural exodus at that time, which packed the cities, and the ‘emancipation’ of the protest movements, youths, women, ethnic minorities, antimilitarists, etc. Sociologically, the analysis of these
demonstrations would be particularly interesting: fleeting, marginal, in organised networks, adhering to local specificities, defiance of pyramidal and centralised systems. The “artisans of a world turned upside down” as labelled by Serge Moscovici.

2.5 Fear and risk in societies

Eight thousand persons die on the French roads every year, a woman who smokes is 3.2 times more likely to breast cancer, one man out of ten will suffer depression.12 These many statistics, picked at random, published in the press or the abundant literature devoted to health, environment, occupational risks, confirm, if need be, that risk is inherent in human existence, to varying degrees. On the other hand, life, in societies like ours, has never appeared safer.

How can we explain this hypersensitivity to risk that distinguishes modern societies, if not by the overmediatisation of scandals and natural disasters that occur across the world? Yet media coverage cannot explain everything.

Another explanation, guilty perhaps of being commonsensical, is worth recalling. During his existence, an individual is likely to face risks that his ancestor could not possibly experience, because his life was not long enough, and because of rapid technical progress. Nuclear energy is the perfect illustration of this. The hypersensitivity to these risks is so strong that it ultimately questions the very idea of progress, and even doubts the values of science itself. A risk expresses a probability. To speak of risk substitutes for an explanation in terms of fatality – ‘that’s life’ – a rational explanation. In this respect, the rise of risk is reflected by the secularism of modern societies. By drawing a brief historical parallel, we can observe a progressive extension of the concept of risk to spheres of human activity and fields that are ever more diversified.

Thus, in the view of many specialists, hypersensitivity to risk is the consequence of this jeopardy of a growing number of dangers, either new, or which have so far eluded out attention. Some can no doubt be ascribed to nature, but others are engendered by society itself. In reply to these crisis situations and the uncertain environment in which societies and corporations evolve, new approaches have been developed, such as risk management. Following the works of Maurice Allais and Mary Douglas, many anthropologists and sociologists are now analysing the differences in perceptions of risk. Risk proves to be more complex than suggested by its probabilistic conception. While having an objective basis, a risk is nonetheless also subjective. Representations made of it vary according to age, professional entourage, circumstances, etc. This sheds light on another paradox, after the growth of risk in a safer society; on the one hand, societies that are hypersensitive to risk, on the other hand, the upgrading of more or less inconsiderate risk taking. Roughly speaking, societies or groups of humans with a hierarchically dominant culture are ‘riskophobes’, while societies with an individualistic dominant culture are ‘riskophiles’, according to the famous triptych of the three societies, the ‘pioneers’, the ‘pure’ and the ‘orderly’. And we live in a society that is mainly governed by the purists and the proponents of law and order, which hold back and govern this society, respectively, smothering the innovative breakthroughs of the pioneers. We can also treat the pure and the orderly as bureaucrats, and the pioneers as the entrepreneurs in the Schumpeterian sense of the term. The ideal is surely the absence of a coalition that is always formed at the expense of one of the families and upsets the arrangement and stability of society. In short, we no longer live in a ‘risky society’ but in a ‘risk society’ according to Anthony Giddens.
The sentiment of fear naturally and physiologically derives from this perception and awareness of risk. Risk is psychological and fear is physiological. Fear is a feeling that appears to have always existed, although it seems to ignore certain heroes, such as Chevalier Bayard, the Vikings, or, to a lesser degree, the diehard Gauls who had only one genuine fear: of the sky falling on their heads! Men have therefore always been afraid, as during the plague epidemics in the middle ages. And yet, for Professor Duby, it is inconceivable to compare nuclear fears with the fearful sentiments that inhabited the population in the year 1000 and after. The nuclear peril is certainly perceived as a scourge, like the plague, but it has never been seen as the premonitory sign of the coming of the Antichrist, and appears far more controllable than other scourges, such as cancer and AIDS. Faced with atomic fear, man is free, it is up to him to pick, to decide, to risk or reject and to debate democratically the measures to be taken, contrary to medieval man.

These two types of fear are dissociable, but they could possibly be associated, like the atom and the plague, in some fringes of the population.

3 Psychological attitudes, behaviours and radioactivity

3.1 Attitudes and behaviours must be differentiated

Behaviours are ways of being or doing, directly observable manifestations, immediately perceptible from the outside, such as habits and punctuality, or the manifestations characterised by common traits forming suitable or adaptable conduct. On the contrary, attitude is not directly observable. It is a more or less durable trait of man whenever he is associated with specific situations or objects. It belongs to the area of the latent, is marked by affectivity. It reflects man’s attachment to a particular value, but can also be acquired and subject to influence or change. Attitudes depend on situations. They also depend on the way in which situations are addressed, spoken about and graded.

In what category can we place nuclear energy? Does it affect the behaviour, an attitude or both? The answer varies according to the class of the person concerned, nuclear industry worker, the public, politicians, according to culture, age, etc.

Very little rigorous scientific data are available, since investigations into the subject are often tarnished with methodological flaws, unfortunately frequent in this discipline. The study by Dr. Fernandez Zoila (covering the years 1960–1967) and observing that nuclear workers speak of radioactive ‘doses’ and ‘spit’ of measuring instruments, also tends to conclude that these ‘neutral’ attitudes actually correspond to an insufficiently structured psychological background, not fully mastered, not secure enough. As if the subject wanted to efface, rub out any possible source of anxiety. This merely marks the cohesion of a group which has learned to control its working conditions to limit any repercussions thereof on human health and protection of the biotope.

3.2 The weight of representations in the perception of risk

Through time and space, from one society to another, and even within any given society, depending on the place and space occupied, perceptions of risk are different. A multitude of threats exist at any time, from the most trivial to the most improbable, so that it is not humanly possible to take them all into account. Hence each person must make a
selection, compile a sort of ‘risk portfolio’, which bears the mark of his social membership and his values. Perceptions of risk are neither independent of cultural identity, nor of social relationships. This diversity of risk perceptions is often presented as evidence of their irrationality; thus only one ‘accurate’ assessment of a risk exists, in each case the one made objectively by experts, so that the mere variety of lay perceptions is enough to disqualify them. This diagnosis ignores the attitude of the layman, who, not content with his perception of the risks, also wants to avert them, deny them, by practices, but also by beliefs.

Roughly speaking, the taking of a risk, exposure to a risk, or the simple awareness of a risk, is reflected by a cultural blindness, an identity conflict, and a lack of knowledge, like the sky falling on the heads of the Gauls. However, some individuals take risks in full knowledge of the facts. Despite its many deficiencies, the monograph devoted by the anthropologist Françoise Zonabend14 to the workers of the nuclear waste reprocessing plant of La Hague reveals the dual attitude of the technicians of the plant, at the workplace and facing the investigator’s microphone; on one hand, the rational attitude implying a close knowledge of the reasons for the safety instructions in order to follow them correctly, to ensure that their daily labour in the La Hague processing plant is as simple and harmless as housework, cooking or doing the dishes; on the other hand, the implicit desire to project value before a woman who has travelled 450 km, coming from the capital, to consider their fate. Like most people, the technicians try to project a more flattering, more virile professional identity. Nothing is simpler than to magnify the risk of irradiation to which they are exposed to ‘impress’ the little ‘Parisienne’, whose action serves their identity project. Françoise Zonabend’s reading of her interviews with the technicians of the plant should have been supplemented with the comments made by her subjects on the interviews. As they proceeded, they became increasingly extravagant, with each individual trying to better his predecessor’s braggadocio, to make fun of an anthropologist demonstrating a cruel lack of discernment and psychology. Ten years after her visit to La Hague, the plant employees still joke about the nonsense that they gabbled. The operators’ perception of a risk that they confront daily is mature and unflappable. It springs from a strength that is calm and responsible. It is a product of modesty and humility faced with matters that must necessarily be controlled and mastered. It is part of the solidarity between all the workers of the plant, because the failure of a single component can imperil the entire workforce. The presence on the staff of a number of officers, petty officers, quartermasters and submariners has helped to edify this modesty of behaviour and this solidarity. However, it differs from that of the plant management and of the experts who have to report, in the form of statistics, objects stripped of all humanity, to the supervisory authorities.15

This gap in perceptions also exists between the scientists and public opinion, since they do not share an identity project, because they belong to different social classes. So how can we grasp this dissonance between experts and laymen? What can we retain from the perceptions of risk?

This diversity clashes with the usual meaning of the term perception. To perceive is to feel a sensation, touch a tangible reality. The notion of perception contains the idea of immediacy of object relations, which would imply that the very perception of an object is the same for all. From this point of view, the risks are not perceived, because the atom is invisible, odourless and colourless. It completely eludes our five senses. Risk appears as an object of representation, more than perception. The way in which we imagine a risk
depends on our beliefs: atomic risk does not exist for the remote tribes of the great desert, nursing infants, or those who fully trust the safety authorities, just as damnation does not exist for the atheist.

### 3.3 The universe of representations

What do King Arthur, a frog, Father Christmas, the Eiffel Tower, the number 7, and the La Hague reprocessing plant, have in common? All these words evoke something in ourselves: an image, a memory, a fantasy, a vague idea. In short, they all exist in the state of mental representations.

In psychology, representation is generally defined as a body of knowledge, beliefs, encoded in memory, and which can be easily retrieved. It also helps to identify, describe, appreciate and behave in such and such a manner with regard to the fact or the individual with which it is associated. All representations structure our mental landscape. In the case at hand, we discover that the use of the atom to produce energy demonstrates many facets, which are these famous representations: they can be treated one by one as a cognitive pattern, made of images, concepts, like the different social representations in the different environments and eras, or as a set of symbols conveying an imaginary world and inspiring multiple evocations. From this blend of congeries, we can identify a number of common logics and mechanisms: mental representations are organised, stable, useful and alive.

How does the brain succeed in encoding these mental representations? A first hypothesis is to consider the mental lexicon of individuals as a dictionary, in which each representation is defined by a list of properties; each of these properties can be broken down into even simpler and more elementary propositions, which were the delight of medieval commentators:

- nuclear energy is produced in power plants
- these power plants are gigantic structures established outside the cities, and have tall stacks
- they produce nuclear waste and work the atom.

But the brain does not, or not only, operate according to its strict rules of propositional logic. It would then be immediately baffled by atypical situations, like a stackless power plant, or a simple rule of inference leading to an absurd conclusion: a medieval castle in the countryside with a large tower would become a nuclear power plant. These processes are obviously unsatisfactory. The brain knows how to distinguish a power plant from a castle, by association with the reference prototype according to a fuzzy and no longer Aristotelian logic. A nuclear power plant is accordingly associated with images corresponding to Flamanville, and also Creys-Malville, La Hague and Chernobyl.

Thus the theory of prototypes, also called theory of patterns, presumes that our memory encodes the data, memories and events, reading a book or an article, listening to a talk not as a list of data, but by assembling them around simple, coherent, familiar patterns. We make a sort of reduction of the mental representations around a stable nucleus, a sort of data formatting by models or frames of reference.

Mental representations are organised around poles of reference. And these anchorages are very stable. Our opinions on psychoanalysis, on friends, globalisation or
cuisine do not vary with the information that we receive; representations resist change, they are stable and robust, because of the triple anchorage – psychological, social and institutional – identified by many disciplines of the human sciences:

- **The deep psychological rootedness** of mental representations is tied to the formation of patterns of perception and behaviour acquired from childhood according to Jean Piaget, or even to forms implicated in our perceptive system. Edgar Morin designates by the expression ‘cultural imprinting’ this very early shaping that ‘is cerebrally imprinted from earliest childhood to irreversibly mark the mind in one’s world of knowledge and action’.16

- **The social foundation** adds to the psychological, mental routines, mechanisms of influence and subordination to the norms of the group, first guarantee stability of representations in everyday life or at the workplace. But if a representation takes root and endures in a group, this is not because of habit and mental inertia. Some representations are more deeply rooted than others, because they assume other functions than those of deciphering the world: a cognitive function, a function of orientation and action, a function of justification of practices and an identity function.

- **The institutional foundation**: representations reproduce and are conveyed via institutions of all sorts: the school, political parties, the state, the media.17

The vision of a power plant is not restricted to a neutral and objective description. It may be deemed to be futuristic in its architecture, or on the contrary, ugly and inharmonious with the local landscape, inspired by operating safety considerations. This affective marking of representation determines the link with the object: can one approach it? Will one admire it? Should one build similar objects on the same model? Representations are not images of reality. They also convey genuine user manuals of the world to determine how to behave towards others, they construct tastes and distastes with regard to this environment, and more precisely, towards the nuclear field.

The relationship of the individual to the nuclear world is thus finalised. This is what the philosophy of the mind designates by the term ‘intentionality’, which means that the ideas that serve to imagine the world entail representations which are guided by desires and objects. For a child, the power plant is therefore an object of curiosity, for a scientist, an object of study, for a neighbour, an object of attention, for an ecologist, an object of aversion.

But even if these representations are stable, they are not frozen. They can vary with time, during the transition from one individual to another; they are then subject to a process of cognitive filtering which distorts and reinterprets the data exchanged in the new categories. Another factor explains the vitality of representations and their transformations: the action of references and the universe of meanings, like, for example, the assimilation with military nuclear, the myth of the new alchemists, the feeling of violation of divine and natural laws. This is why the image of civil nuclear can assume various forms in our minds.

Let us recall Plato and the myth of the cave. For thought to be true, it must represent the real. But sensitive data and images take their toll. So what is the right representation? How to integrate the notion of error? Are the emotions a source of consciousness and hence of representations?
4 The value of myth and symbol

Mythology is the study of myths. A complex natural phenomenon, myth can be studied from various angles. In general, it is a tale charged with symbols, which relates the origin of the world, of the gods, the creation of animals and men, the origin of traditions, rites and certain forms of human activity. Myths are founding elements. All cultures have possessed them and still do. Narrative of events harking back to the prehistory of man, tales staging supernatural beings and processes, they illuminate, by their multifaceted nature, many aspects of individual and cultural life.

From its very beginnings, myth poses a problem of meaning and interpretation, and controversies have accumulated as to its value and its status.

4.1 Myth, history and reason

In ancient Greece, mythos and logos were not antithetical; both designated a sacred tale about gods and heroes. But Xenophanes, Plato and Aristotle exalted reason and denied myth its capacity to grasp the real. Against the concept of myth, Judeo-Christian tradition opposed that of history: the God of the Hebrews and the Christians is revealed to humanity through its history; God was revealed to Moses in the Egypt of the pharaohs. While they are fundamentally important, these distinctions between reason and myth, between myth and history, were never quite absolute. In Islam, mythos and logos merged, mythos becoming logos. With regard to some myths, Aristotle in old age concluded that mythos and logos can, in certain cases, overlap. Plato used myth as allegory and as a literary process enabling him to develop an argument. Finally, myth, reason and history co-exist in the prologue to the Gospel of St. John.

The ‘enlightened’ philosophers, anxious to impart meaning to myths, seemingly irrational and fantastic, considered them to be the expression of an intellectual effort to explain the world, like a stage in the evolution of human thought, advancing from ignorance and the irrational towards the rational.

4.2 Myth and language

Since myth is a narrative, many scholars have focused on its linguistic structure. Friedrich Max Müller, arguing that myth exemplifies the historical development of language, saw, in the gods and in the events described in the Vedic texts of ancient India, not real beings or events, but the early fumblings of human language, an attempt to express natural phenomena, the sea, thunder, fire, etc., through visual and sensual images. More recently, Claude Lévi-Strauss suggested that the components of myth are ranked in the same way as the components of language, and sought in mythology in the manifestation of a permanent and interminable human knowledge.

4.3 Myth and knowledge

Theories claiming that myth is a form and a means of knowledge are as ancient as the interpretation of myth itself. The superimposition of mythical and rational modes was investigated by the Greek philosophers, and particularly by Origen.

Two major orientations stand out in the relationship between myth and knowledge. According to the first, myth is conceived as an intellectual and logical concept. For the
second, it is studied in its imaginative, intuitive meaning – either as a mode of perception that is different from the modes of rational and logical conception, or as a mode of knowledge predating rational knowledge. One of the fathers of British anthropology, Sir Edward Burnett Taylor, believed that in archaic cultures, myth was based on a psychological illusion, on a confusion of objective and subjective reality, of the real and the ideal. He attributed to myth a moral value. Some time later, R.R. Marett saw in myth an emotional response on the part of primitive peoples with regard to their environment. He situated the significance of myth in an intellectual step earlier than rational thought. The ethnographer Maurice Leenhardt explained myth as the expression of experience lived by the community. Leenhardt, who lived for many years among the Melanesians, observed that they responded passively to non-human realities, not seeking the intellectual or technological mastery of their environment, but trying to adapt to it and to compose with its forces.

Lucien Lévy-Bruhl (1857–1939) further developed the concept of prelogical mentality by suggesting that primitive peoples, in the absence of any logical category, acquired knowledge of the world by a mystical participation in reality, and expressed this knowledge in their myths.

Andrew Lang (1844–1912) and Wilhelm Schmidt (1868–1954) noted the frequent presence and simultaneous incorporation of the rational and the intuitive in certain myths. Mircea Éliade argued an interpretation of myth that was both rational-logic and imaginative-intuitive. According to him, myth reveals a primitive ontology, an explanation of the nature of being. Via symbols, myth expresses a complete and coherent knowledge despite its trivial and groundless appearance, it allows a return to sources, a discovery or rediscovery of the nature of man. Paul Ricoeur felt that the existence of myth was necessary to correctly understand the origins, processes and depth of human thought.

4.4 Myth and society

The philosophical and speculative interpretation of myth by Giambattista Vico raised the problem of the relation between myth and society. In his Principles of the Philosophy of History (1725), he assumed four steps in the development of myth and religion in Greece: in the first stage, the divinisation of nature, thunder and the gods became Zeus, the sea became Poseidon. In the second, gods associated with the domestication of nature appeared: Hephaestus, god of fire, Demeter, goddess of seed. In the third, the gods incarnated human institutions (Hera, marriage). And the fourth and final stage saw the humanisation of the gods, as we discover them in Homer.

Examining the relation between myth and society, Émile Durkheim delved into the aboriginal cultures of Australia and asserted that myths are the reaction of individuals faced with the social phenomenon: they expressed the way in which society represents humanity and the world, and constitute a moral system, a cosmology and a history. Refining this sociological conception of myth, Bronislaw Malinowski endowed myth with an indispensable function, that of expressing, improving and codifying beliefs. By guaranteeing morality, myth contains the precepts destined to guide the individual.

Accrediting the thesis that myths are born from emotions, Ernst Cassirer argued that myth is not identical to the emotion that engenders it, but is the expression thereof – objectivisation, in which the identity and fundamental values of the group acquire an absolute meaning. In his view, myth and mythical modes of thought form the substrate of the western cultures, scientific and technological.
4.5 Value of symbolism

Symbolic elaboration is an experiment in freedom, not the existential freedom that enables men to engage in the world and assert universal values in their acts. But it nevertheless affirms the power of the imagination and the desire to downgrade immediate impressions. Symbolic elaboration is nothing other than the ‘imaginary’.

The distinction between the real and the imaginary does not mean that the imaginary is the opposite of the real. ‘The imaginary’, writes Breton, ‘is what tends to become real’. The imaginary is formed from elements of the real and does not correspond to any particular ‘ex nihilo’ creation. If I can imagine the sky of a distant country from simple accounts of travels, this is undeniably because I can remember images formed from earlier conceptions and because I can associate them in original combinations. An imaginary universe exists, produced from elements of the real. The idea is to place the real in parentheses, without entirely denying it, because the imaginary must be able to refer to the real.

5 Conclusion: analyses of the causes of public opposition to nuclear energy and its consequences

First, we must distinguish three sociological castes, deeply compartmentalised, which grasp and make judgements of the civil nuclear industry: individuals who believe that the risks are always greater than they have been told – the ‘visible part of the iceberg’ category – those who believe that in fact, the record of the ‘body count’ category is deliberately blackened, and finally, those who remain convinced that the risks are radically different from those reported to us, without knowing what they really are – the ‘worry beat type’ category.

On the same model, it is possible to distinguish historically three types of value judgement, functioning independently of the above three human categories. The first is the scientific value judgement on which the whole community of experts and specialists agree or disagree, like the lowest level risk of harmless radiation; the second is the social value judgement, based on the estimation of the risk/benefit ratio: how safe is safe; and finally the third is the managerial value judgement with the establishment of measurement standards to quantify and provide a decision. It is important for these three judgements to exist independently, just as the three categories of human perceptions faced with the risks must also exist.

During the three postwar boom decades, metatechnologies promising solutions to the problems of society, of ecology, circulated and shaped mentalities. The discourse of the technicians and scientists prevailed, with the consequence that this caste took over the scientific, societal and managerial decisions for the other two categories of persons. Unfortunately, the events – particularly military, or environmental – which occurred after these three decades, demonstrated the limits of this decision-making approach.

The confusion that resulted from this state of affairs was not surprising, and the general awareness, qualified mysteriously as civic, grew steadily. The multiplicity of opinions increased in proportion to the number of questions to which the scientist could, or could not, reply. Each state hence developed a different nuclear energy policy, which did nothing to facilitate an understanding by global public opinion. This context is the
Myths, symbols, society and nuclear energy

335

cradle in which the first reservations were born about the use of nuclear energy for
civilian purposes, assisted therein by the Three Mile Island, Windscale and Chernobyl
accidents, and the mythological burden that they suggested.

The importance of the problem of communication and of the acceptance of the
development of nuclear energy by societies is significant. We have the press that we
deserve. The mass public is no longer keen to see the musical comedies of Gene Kelly or
Fred Astaire. It now has a voracious appetite for satanic films in which Evil triumphs,
films creating new mythologies imbued with violence and fear. We cannot accuse the
media of being the creators of these new behaviours. They simply respond to a need that
is quite different from the need for scientific knowledge, the need for fantasy, illusion,
phantasmagoria. The image, absorbed without reflective effort, has become the principal
vector of the transmission of information, to the detriment of writing, which demands an
intellectual effort to be assimilated. Man no longer reads the letters of the alphabet,
images tell him to turn right, to pick up his luggage.

While we may deplore this development or not, we simply have to accept it and adapt
to it. It is certainly not by attracting the attention of the public to sensationalism or by
drowning it in figures, that we can improve the process of communication and awareness
of the atom.

Nuclear energy developed at a time when societal patterns were established, where
the practice of systematic observation of social facts had entered into the mores, which is
not necessarily true of the previous technical and scientific revolutions or innovations,
that is to say, with a wider degree of adaptability. Responses to nuclear energy are
conditioned by situational factors – the environment – or series of events, local, material
conditions, in which the future of society is written.

The concept of the atom must therefore integrate all the artifacts deeply anchored in
popular mentalities. Electricity successfully achieved this accommodation, in conditions
that were fairly similar and comparable. The only specific feature is the past and the
shadowy and factual ‘Curriculum Vitae’ that civil nuclear operations drag like a ball and
chain. It is necessary to submit and acquiesce that nuclear energy means provocation, the
perverted use of nature which we want to enslave even though the physical process of
fission was born with the Earth, 1,800,000,000 years ago.

The atom is deeply anchored in history. It blends references drawn from reality and
fiction alike.

Is the concept of risk so central? If the real risk seems almost irrelevant, the level of
safety having been controlled, a lot of groundwork seems appropriate on perceived risk,
the subjective risk buried in a real and eminently open-ended ‘culture of risk’. This risk
must be taken into account in the same way as susceptibility to emotion and the
imaginary.

Upstream fears are processes of expression and collective reactions that have always
been present through the history of societies. Our era nonetheless appears to be less
receptive to endemic fear. This does not preclude an in-depth study on the objective
tough cores underlying these sentiments, and their immediate or distant consequences,
latent or savage. This study could be interesting to gauge alongside the work on the
difference between real risk and perceived risk.

The attitude towards nuclear energy expresses the whole of a personality, it is the
consequence of a reaction, a deep commitment, an education, beliefs and somewhat attest
to the way in which the world is perceived.

The irrational obeys laws and mechanisms which are not absurd, by any means. It is
therefore necessary to analyse them and to make use of them. How? By whom?
The employees of the nuclear industry, whom nobody can suspect of lying or trickery, are the spearhead, are at the front line, are the best, if not the only, vectors bearing information that will be received and accepted by the public at large. The reconstruction of the nuclear image necessarily entails the complete but unhindered and untrammelled involvement of the employees and their representative structures, the unions.

Further readings


Notes

2. le sentiment de la mort nucléaire – Louis Vincent Thomas – Communications, 57, 1993
5. Alain Touraine, a French sociologist, earned his fame with his studies on the condition of workers in the Renault factory. Note that a very large portion of his studies and hence of his conclusions covered the work that he did on the machine tool repair shop, where the working conditions were the strict opposite of those in the plants: technical action on an individual case basis against mass production; fully self-sufficient working groups, consisting of specialists who were asked for reflection and intelligence, against work in a team composed of workers whose skills were reduced to the minimum, having no managerial authority, and who were asked, in Henry Ford’s words, ‘above all, don’t think’. It is therefore legitimate to question these conclusions.
6. Touraine’s text does not state what he means by ‘deeper modernisation’.
8. To resume the expression of J. Delumeau or de M.H. Labbé.
9. 1985, creation in the USA of a task force of the prevention of nuclear terrorism.
Symposium on the psychosociological implications of the development of the nuclear industry – Professor Duby, 1977.


The author of the article worked for ten years at the La Hague reprocessing plant.


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