NON-KILLING SCIENCE

Antonino Drago
University of Pisa and University of Florence

What relationships are possible between science and technology, on the one hand, and peace, on the other? In our times neither science nor peace are defined in one single way; any current meaning is questioned and unstable. Owing to this fact, in the following I will offer four meanings of the notions of both science and peace – the dominant ones, the Marxist ones, the religious ones, the non-violent ones -, from a historical perspective. I will then present a way of recognising a non-killing science in the past development of science and then formally define it together with an alternative way of solving international conflicts. The implications for the relationships between science and ethics are derived.

1. Military science and military technology

Historically, in order to defend a country from enemy attacks, both science and technology have always been applied for military purposes; that means, in brutal terms, to kill men, provided that they are qualified as enemies.[1] In particular, in the last three centuries improvements in weapons powerfully supported an unceasing arms race, each country wanting to thus achieve the winning strategy for all kinds of war.

In the 1940's the Manhattan project to construct nuclear bombs in the US, constituted a milestone in the history of both progress of the arms race and of scientific research; the latter was subsequently organised as an industrial initiative of large groups of scientists financed by funds that only a powerful State could afford. No surprise if the gap between advanced countries and

[1] *The Bull. At. Sci.* March 1978 illustrated the historical increase in the killing capability by the scientifically improved weapons of all times; killing capability is defined as the number of causalities produced by an hour's use of a weapon against unarmed persons, whose density on the ground is four per square metre: Sword 20; Cross-bow 32; 19th Century gun 150; WW1 machine-gun 13,000; WW1 tank 68,000; WW1 cannon 470,000; WW2 cannon 660,000; WW2 tank 2,200,000; WW2 bomber 3,000,000; A-bomb of 20 kton 49,000,000; H-bomb of 1 Mton 660,000,000. Of course, these figures represent virtual events because such a large and densely grouped population does not exist over 100 persons. But these figures well represent the growth of the killing power that has been at the disposal of those managing wars.

developing countries in scientific research is the greatest (it was, before China started its momentous progress, 97% against 3%); it is similar to the gap in military arsenals only, in particular in nuclear arsenals.

Moreover, military technological progress, and in particular the nuclear arms race, was pursued even by those countries that, being against Western dominant policy, could have reversed this strategic trend; indeed, both Communist and Islamic countries embraced this policy.

In this intellectual framework *peace* is meant in a passive sense, as a trustful delegation by the citizen to experts (and in their turn, to computers!); they, in the name of the best scientific practices, assume the charge of resolving all acute conflicts. In fact, most scientists are working to achieve peace with this attitude.

But as a result of the universal arms race, the level of insecurity of the entire World grew to an unhealthy and absurd level. Through science, which constitutes the best symbol of mankind's highest intelligence with respect to all other species, the human species was able to construct the tools for perpetrating its own destruction. Moreover, the more powerful countries organised their collective defence in such a way that they would be able to launch an attack in a very short span of time, say some minutes, through a highly complex apparatus which for the most part works automatically; the likelihood of a mistake made by this apparatus is very high if we consider the catastrophic consequences of such a mistake. Thus, at the present stage of our development mankind's survival is safeguarded by partially reliable machines !

The story of Einstein constitutes a warning. At the beginning of the 20th Century Einstein discovered the formula for producing nuclear energy ($E=mc^2$). Then, in WW2 he, although he was an anti-militarist and anarchist, was so frightened by the short-term prospect of Hitler being armed with nuclear bombs launched by means of V-2, that he asked (the United States president?) the head of a State (i.e. US) to build a nuclear bomb; he thought that this was the only way of opposing the Nazis' plan to dominate the entire World. But Hitler failed to obtain the nuclear bomb, the US got there first, and then, even though it was not necessary,[2] tested two different bombs on the Japanese people. Of course, Einstein was deeply troubled by the result of his initiative. He was then very active in promoting peace by other means. In particular, he promoted, together with B. Russell, a celebrated Manifesto, in which many Nobel prize scientists warned mankind that it faced a dilemma: either to maintain the considerable likelihood of self-destruction, or to promote an unprecedented period of welfare, which could be obtained through the peaceful application of the

[2] It is known that in July 1945 the CIA intercepted and decoded a message from Hiro Hito to Stalin who was at that time neutral, to obtain an honourable peace from the US.

new scientific theories.[3]

However, his warning was not heeded by dominant World leaders. Nuclear arsenals grew beyond any possible reasonable use for destructive and threatening purposes. After Einstein the link between science and war became so strong that military research prevailed over civil research, for example, in the percentage of US federal funds for research[4] (it was certainly the case in several countries, above all in developed countries). In the '80s US scientific-military research for "star wars" for the first time surpassed both the dimension and the amount of funds of the Manhattan Project; such a gigantic amount of funds polarized the whole of US scientific research. It was unsuccessfully opposed by half of academic scientists, who undersigned a specific declaration of conscientious objection to funds, careers, academic and political power derived from this kind of research.

According to common opinion, unless a new way of defending a country is shown to be viable for the entire population, military violence has to be pursued whatever the costs to be planned to charge to other societies, but also whatever social costs are to be supported by its own society.

2. Peace as a scientific solution

What justifies this deeply rooted attitude? Civil society is led to accept the above costs by the enjoyment at the same time of a large number of new commodities produced by Science and Technology for civil welfare.

Indeed, in the history of Western civilisation the interaction of modern science with technology created a virtuous circle; science produced useful technological applications and at the same time technology produced hints for new theoretical ideas. As a result, science significantly improved, beyond any artisan's imagination, the previously primitive development of technology. And technology achieved such a powerful capacity to transform the World that it now constitutes for each person an exoskeleton,[5] which supports an amazing improvement in his life.

Western historical progress in the last three centuries has been greater than any in the history of mankind. No surprise if it became the fundamental value of the leading Western societies. Furthermore, such progress was able to involve almost all the peoples of the World.

Science and Technology are seen to be intelligent, rational tools that produce the best solutions

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[3] A. Einstein and B. Russell: 'Manifesto', 1955, see the site Pugwash.org.

[4] At the top of?? the East-West struggle, an investigation by E.L. Woollett: "Physics and modern warfare: The awkward silence", *American J. Physics*, **48**, febbr. 1980, 105-117, gave 48±4% of the US scientists employed full time in arms production.

[5] L. Mumford: *Technique and Human Development*, Beacon, Boston, 1967.

to both social and individual problems. Scientists volunteered to unravel the knotty problems of the World: hunger (the green revolution, GMOs), energy planning (nuclear power), disease (scientific medicine, genetic modification), etc..

Owing to this historical and social capability to transform the entire world rationally, science includes within itself a perspective of peace. Indeed, science is supposed to bring peace in so far as it proposes what is the best solution according to the universal reason: *Calculemus!* (Let us compute! Leibniz), and the resolution of a dispute will come without any personal effort. In short, according to this dominant attitude, *peace* can be obtained by supporting science, and scientists are the most effective operators for peace in the World, notwithstanding the enormous destructive powr that science was capable of achieving for fighting a war.

In the Western world, this pro-science ideology became established because it was accepted by even the strongest political alternative i.e. the politics of the workers movement. In particular, the Marxist school always supported this kind of science and this kind of progress, wanting to qualify itself as the first political ideology of a scientific nature; it mocked the mythical Luddite worker, who tried to destroy machines in order to save workers' jobs; and moreover it called “renegades” both Duehring and Bogdanov who tried to construct an alternative science of nature.

Some leftist groups criticised science when it became scientism, i.e. an acritical attitude which puts so much trust in science that it attributes to it the power to subjugate politics. The Chinese cultural revolution (1958-72) was an attempt to find an alternative to that Western scientific progress that characterized development in the Soviet Union. In Europe the Apollo 11 mission of US astronauts to the Moon gave rise to a heated debate among leftist scientists.

But they all distinguish Science sharply from Technology; according to them, the latter only is influenced by the dominant centres of social power. Hence, *peace* can be obtained by supporting pure science, while selecting the positive part of technology and at the same time leading people against the negative part of technology; that means pursuing, beyond demonstrations for peace, a political struggle for not only improving positive technology, but also for conquering, through a revolution (which according to traditional Marxism is a violent one), that new society which alone provides social justice, which then generates both good technology and peace.

3. Science and cultural violence

Putting aside the questions on social misuse of Technology and bad technologies, let us investigate the social role played by Science. We know that in Western civilisation the organisation

of Science was such a macho social structure as to be comparable to nothing less than the institution of the Army. Is the social role played by Science actually a violent one?

Galtung wisely articulated the notion of violence in the three notions of direct, structural and cultural violence.[6] A culture is violent (at least) when it supports structural violence. By applying these qualifications, it is apparent that scientific culture plays a violent role in present society. If we refer to the most apparent violence, a violence that kills, one has to recall the constantly increasing number of people suffering from hunger (913 million, more than 10% of the World population). Hence, present scientific development proves to be disastrous for the majority of mankind. But people justify the present distressing situation by assuming the prospect of World welfare in the near future, which will be achieved through a certainly beneficent progress for all. Surely, science is one of the main supporters of this justification when it promises for all peoples significant increases in crop production, new powerful technological tools for agriculture, important improvements in social health and all the other benefits of an advanced social life.

Let us ask: Does Science's violence contingently originate from a number of malevolent people misleading it, or from some negative production structures, or does it even originate from in itself?

In order to answer, let us inspect science closely. Science is a characteristic cultural phenomenon of modern times, unlike any cultural phenomenon of non-Western societies or even ancient times. Science results from joining experiments with formal (i.e. mathematical) hypotheses. The main characteristic feature of each of its conclusions is to be verified by experiments.

Science is a collective initiative which accumulates objectively verifiable results according to directions of research which explore all sectors of Nature and even the relationships of man with himself. Present Science is a theoretical framework that represents the real world so well that it leaves almost no disagreement between its conclusions and known phenomena. In history, it has become such a great intellectual construction as to constitute a systematic ideology without equal if we look at other systems of thought, which all prove to be weaker, less systematic, and less persuasive in their conclusions. This ideological construction aims to empower mankind to manage Nature in all the specific sectors which it studies.

But it is just this project of empowerment that leads us to suspect a violent role played by science in the history of modern civilisation. As a first approach to a better understanding of the nature of science, let us ask: was the historical development of modern science violent with respect to other cultures?

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[6] J. Galtung: "Cultural Violence", *Journal of Peace Research*, **27 n**o. 3 (1990) 291-305.

The birth of science itself had a violent impact on institutional theology, which at that time dominated intellectual life. On that occasion, the Catholic Church won out over the Italian scientist Galilei. But afterwards in Europe modern science had its revenge; it persuaded people that traditional theology was unable to oppose its truths rationally. Then theology was progressively confined to a backward intellectual attitude.[7]

Science grew, both in the number of scientists (at present it is carried on by almost a million scientists in the World), in the results (for instance, let us recall that chemistry introduced several tens of millions of new molecules into the environment) and in the fields of the human knowledge (from astronomy and mechanics to acoustics, hydraulics, chemistry, geology and psychology), that have been re-formulated on new foundations.

But the expansion of science was so rapid and its impact so great that single human mind could not grasp it in its entirety. Indeed, modern philosophers have been unable to follow its momentous development. Kant's attempt to reconcile the two ways of conceiving the philosophy of knowledge, i.e. rationalism and empiricism, collapsed when a further development of science – i. e. the birth of the non-Euclidean geometries – shook the premises that Kant had maintained to be eternal and ineluctable (in particular, the category of space). Later, most scientists burnt all their bridges with philosophy as well, charging it with being an obstacle to healthy scientific research. Subsequent philosophy was able to suggest merely subjective analyses of science, although science is both a collective initiative and a structural institution of the present society. After three centuries and half the birth of modern science, present philosophy is unable to define scientific culture.[8]

In short, the birth of science also determined a crisis in philosophy, not only was faith humiliated, but also reason, as it is developed in a philosophical system. In fact, for three centuries there has been no intellectual system that could rival that of science.

Being constituted by universal laws of Nature generated by objective experiments in a collectively verifiable way, over the centuries science claimed to be absolute and not subject to any kind of constraint and confidently presented itself as an intellectual enterprise devoid of internal conflicts and therefore able to offer an absolutely certain solution to any human conflict. In particular, Newton wanted to build a new ethics on mechanical laws, encompassing all human behaviour.[9] A century ago, mathematical formalism (Hilbert's programme) claimed that science,

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[7] M. Kline: *The Mathematics in Western Culture*, Oxford U.P., Oxford, 1953, ch. XVII.

[8] An exception is the posthumously published analysis by E. Husserl: *The Crisis of European Sciences and Transcendental Phenomenology* (1954), North-western U. P., Evanston, 1970.

[9] I. Newton: *Optiks*, London, 1704; 31th Query.

when axiomatized, is independent from any link with the outside and is capable of re-stating rigorously the whole of scientific, and even world, culture.

4. Is Western progress a truly development for mankind, or does it do violence to the spiritual life?

In the '30s the sociologist R.K. Merton characterized the underlying ideology of the West, i.e. Science, as an individualist, Anglo-Saxon and mainly Puritan initiative.[10] The best representative of this kind of scientific initiative was the chemist R. Boyle, owing to his rigorous curriculum of studies, personal goodwill, the spirit of self-denial in devoting himself to discovering nature's secrets, the universalistic passion for mankind's welfare; in short, he interpreted a modern way of living a monk's life; while the architectonic representation of this kind of scientific initiative was constituted by the University colleges, which were built on the model of the old Roman or Gothic convents and moreover were usually named after Saints or even the Holy Trinity.

Most Christian Churches shared a favourable attitude towards Science. Moreover, a pro-science ideology of this kind penetrated to the common people and was brought to the Third World by priests and missionaries, who believed that scientific progress would give human dignity to the primitive. In this sense, the expansion of science and technology, which brought with it increased welfare, appeared to naïve persons as a spiritual blessing. Indeed, most people embraced an ideology according to which science is a modern salvation not only materially (let us recall epidemics or the work of slaves), but even spiritually in that it eliminates both social and psychic evils.

On the other hand, the powerful catholic Church accused science of being against both religion and spirituality. However, finally, after long, hard struggles, in the 20th Century, the attitude of the Catholic church became favourable. Without an official document, during Vatican Council Vatican 2 the group of "incarnationist" theologians gained ascendancy over the group of "eschatologist" theologians; in other words, in the present attitude of the most authoritative theologians, the will to be involved in even the contradictions of the world prevails over the will to emphasise the separation of spiritual life from the evils of the society.

As a consequence, the same theological theory took its place among the other sciences, as a specific science mimicking the techniques and the aims of the sciences that are closest to it. In

[10] K. Merton: "Science, Technology and Society in Seventeenth Century England", *Osiris* **4** (1938) 167-171.

conclusion, the previously severely condemned Science was accepted as an inevitable reality.[11] What had previously been the enemy, i.e. catholic Church, was thus conquered by Science. As a consequence, in the last century, society in general formed a favourable conception of science's relationship with spiritual life (even in an atheistic sense[12]). In particular, Catholic theology passed from conceiving peace as a metaphysical "gift from God" to taking up the social slogan: "[scientific] progress is the new name of peace".[13]

Finally, the scientific conception of the World as suggested by Science seemed to be the only one possible. Never in the history of mankind did a cultural phenomenon occur that was so pervasive and so dominant among the people of the World (we find something approaching it in Europe under the Roman Empire and in Christianity in medieval Europe).

5. A radical criticism by the non-violent authoritative figures of the dominant scientific and technological progress

What has been said above raises the following question: Is it possible to object to science?

The history of the 20th Century left two legacies; i.e. a bloody list of scientifically performed slaughters (wars), occurring mainly in Western countries; but also a marvellous achievement, obtained in a non-Western country. Gandhi renewed the people's ability to solve conflicts – even extreme conflicts such as anti-colonialist struggles and rebellions against dictatorships are -, with non-killing means, i.e. without weapons that threaten the survival of the adversary.

This achievement produced also a new way of thinking with respect to the Western tradition, non-violent political theory.[14] In particular, the non-violent movement did not share the State's belief that in war ever more colossal carnage represents mankind's progress; this social movement radically opposed wars, the arms' race and all social structures supporting them. Owing to the strong link between the arms' race and social progress, they concluded that the dominant progress itself had to be contested, including the most monumental product of Western thought over the centuries: Science. The great teachers of non-violence (Tolstoy, Gandhi and Lanza del Vasto) radically criticized Western science. They shared the thesis that science represents the wrong

[11] An international Vatican conference has been announced, to be held in the spring of 2009, in which Darwin's evolutionist theory will be rehabilitated (re-examined?).

[12] See the investigation on 60,000 academic professors reported by R. Stark and F. Roger: *Acts of Faith: Explaining the Human Side of Religion*, University of California Press, London, 2000 and the more recent investigation by E.H. Ecklund: "Religion among academic scientists: distinctions, disciplines, and demographics", *Social Problems,* 54 n. 2 (2007) 289-307.

[13] It is the title of the "Conclusion" of Pope Paul VI: *Populorum progressio*, 1968.

[14] Beyond the several books by authoritative non-violent thinkers, see A. Drago: "The Birth of Non-Violence as a Political Theory", *Gandhi Marg,* **29** no. 3 oct.-nov. 2007, 275-295.

direction taken by the human soul gone astray. The non-violent Tolstoy started a radical attack on Western science by asking the question: "Science can give answers to everything but the important question 'What is life for?'";[15] that is, Science is separate from our life since it lacks an ethical dimension.

Twenty years later, i.e. just a century ago, Gandhi wrote the "red-book" of the Indian revolution: *Hind Swaraj*;[16] in it Gandhi radically questioned, from the viewpoint of ethics and non-violence, one after the other all the areas of Western progress. He also suggested how to re-build them on a clear ethical basis, at the cost of being accused of a backward attitude. He also criticised Western science.[17]

Gandhi's criticisms mentioned above have been considered too crude even by the politicians who followed him. But fifty years after, his one Western disciple, Lanza del Vasto, improved on them. He based them upon two sacred texts of the Western tradition.

He interpreted the Original sin (Genesis 3) as an inversion of human knowledge from the loving contemplation of the World to that knowledge-calculation of good and evil which is used for utilitarian purposes.[18] This exploitative attitude regards not only nature but also people. Hence, this

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[15] L. Tolstoy: *My Confession* (1882), London, Bradde Books, 1963. M. Weber: *Intellectual Work as a Profession* (1919), reiterates this question as one of the most important ones in European culture.

[16] M.K. Gandhi: *Hind Swaraji, or Indian Home Rule* (1909), Navajivan Publ. House, Amhedabad, 2000[13]; PDF version in: http://www.soilandhealth.org/03sov/0303critic/hind%20swaraj.pdf#search='Indian%20Home%20Rule, ch.s VI and XIX. Indian tradition qualifies this epoch as the *Kali Yuga*, the Dark Age.

[17] Usually the anthologies of Gandhi's writings (an endless number of short articles comprising more than a hundred volumes) miss these criticisms. In M.K. Gandhi: *The Writings of M.K. Gandhi* (R.N. Iyer ed.), Oxford U.P., Oxford, 1986, §§. 108 and 110, are quoted the more mildly ones.

[18] Lanza del Vasto: *Les Quatre Fléaux*, Denoël, Paris, 1959, ch. 1. This interpretation was summarised in three lectures in the English language which he gave in Gujarat Vidyapith in 1977; see the site http://www.wikilivres.info/wiki/Pilgrimage_to_Non-violence. A similar interpretation of original sin has been already suggested by A. Toynbee: *Christianity and Civilization. From Civilization on Trial*, Oxford University Press, 1948. Incidentally, notice the following statement by Toynbee on religious violence: "A church is in danger of lapsing into this idolatry insofar as she lapses into believing herself to be, not merely a depository of truth, but the sole depository of

original sin is not the product of the times, but is the origin of every society; it is essentially a structural sin. Within social relationships it grows by exploiting formalities to cover up selfishness; above all the most formal intellectual activity, i.e. the making of laws, which actually formalise pyramidal social power in a society, and even more so may Science, whose aim to exploit nature for the benefit of all, hides any number of malicious political aims.

By hiding the attitude of domination of the few over the many, the above formal institutions may grow until they completely dominate the people, as an impersonal dictatorship. According to Lanza del Vasto, this extreme social situation is described by Apocalypse 13, through a Beast rising from the sea and dominating the world. He interpreted it as modern Science, because "The irreparable lack of modern science is that it lacks someone who knows it entirely";[19] that means that at present we are subordinated to the super-human project constituted by scientific progress. Then Apocalypse 13 describes a Beast rising from the earth, whose authority depends on the power of the former Beast. Lanza del Vasto interpreted it as the Machine, or the State-Machine; which, by dispensing numerous facilities and conveniences, leads to a false kind of development, where even the wisest seek personal profit rather than cooperative fairness; so that social life becomes based on such a degree of alienation as to become entirely subjugated by the two Beasts:

> "[16]And he shall make all, both little and great, rich and poor, freemen and bondmen, to have a character in their right hand or on their foreheads: [17]And that no man might buy or sell, but he that hath the character, or the name of the beast, or the number of his name."

It is easy to see in this description the dictatorships that infested advanced European countries some decades ago. Thus, modern civilisation, by relying upon the worldwide expansion of Western science, is seen by Lanza del Vasto as the greatest renewal of Original sin.[20]

At present this negative attitude towards modern science goes against the present attitudes of Christian churches. It is on this issue that there is greatest divergence between the non-violent attitude and the attitude of Western Churches, otherwise very sympathetic to non-violence. But at present this critical vision of Science is shared, at least in part, by some political movements, e.g. the radical ecological movement.

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the whole truth in a complete and definite revelation." By merely replacing the term "church" ,this statement may be applied to Science.

[19] Lanza del Vasto: *Les Quatre Fléaux*, op. cit, p. 240.

[20] In the history the past interpretation of Apocalypse 13, the one above is the first interpretation of a structural kind, i.e. it sees the actors in terms of social structures, instead of some individuals or even abstract ideas. As a consequence, it involves a conversion not only at the personal, but also at the collective level, by means e.g. the conscientious objection. the foundation of a communitarian life as an instance of the alternative society (Lanza del Vasto founded, first in France (1948) and then in some other countries, the Ark communities, which are similar to Gandhian communities) and struggle to change both evil institutions and negative society.

According to the above non-violent teachers, the meaning of *peace* is the opposite to that attributed to peace by the traditional scientific vision for which its meaning is abstracted from the person's life, while the former, by trying to solve conflicts through interpersonal relationships, relies heavily on the personal witness of the kind of life one chooses. Moreover, peace is understood not just at an individual level; i.e. a new ethics is actively sought at the political level of society as a whole. Let us recall that Gandhi's life united Indian and Western culture through the notion of "law"; which in the West is juridical law (of which Gandhi, as a lawyer, was a representative) and in the East is inner law ("the little inner voice"). Therefore, in the wide arena of all social relationships peace is achieved by promoting a new kind of social ethics which relies on co-responsibility,[21] the egalitarianism, sharing, justice, community. In short, an ethics relying on trust in man and therefore anti-Machiavellian.

6. Any conflict within science?

But, if the non-violent position of the great teachers is correct, i.e. that science represents the breeding ground of the present cultural violence, then should we reject Western science?

Indeed, the above criticisms of science come from outside science. They may be the result of pre-conceptions, insistently maintained by some who are nostalgic for the past, as well as by those resistant to change.[22] However, I have taken these criticisms seriously, especially those of Lanza del Vasto, and I have devoted thirty years of my scientific life trying to clarify the problem.[23] I asked: Does an alternative science exist? Does a non-killing, non-violent science exist? First of all, is there a conflict between two ways of producing science?

Let us start to explore science on the basis of the above questions avoiding what cannot be fully grasped by laymen, i.e. the technicalities or a philosophical debate.[24] We will look at the historical development of the relationship between science and conflict; and then at the conflicts within science.

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[21] Some decades later, H. Jonas: *The Imperative of Responsibility* (1979), U. Chicago P., Chicago, 1984, started a renewal of social ethics by supporting the view that we have to be responsible with respect to both mankind's survival and the welfare of the future generations.

[22] For instance, there exist several celebrated books on the relationship between modern science and Eastern philosophies; e.g. F. Capra: *The Tao of Physics*, Collins/Fontana, London, 1976[3] (translations in 23 languages); G. Zukov: *The Dancing Wu Li Masters - An Overview of the New Physics*, Bantam New Age books, New York, 1983, etc.. But they compare intuitively scientific notions with those of Eastern philosophies, without examining the formal notions of science.

[23] A. Drago: "A historical critique tof Western science", *Int. Peace Res. Newsletter*, **16**, (1978), p. 32-37; "What science for Peace?", *Gandhi Marg,* **7** (1986) 733-742.

[24] The present viewpoint will be qualified in philosophical terms in sect 8.

Two historians of science introduced the subject of the conflict into their illustrations of past science. Fifty years ago, A. Koyré[25] cleverly interpreted the birth of modern science as determined by the use of the notion of infinity. Remarkably, at that time some scientists (Huygens, Descartes, etc.) supported potential infinity (whose best instance is a counting of natural numbers, i.e. an unlimited process which lacks a final number), whereas other scientists (Newton) supported actual infinity (whose two best instances are the final end, i.e. the point at infinity, of a straight line and the infinitesimal, which is defined as a number which is less than all real numbers).[26] Hence, Koyré highlighted a basic conflict at the birth of modern science. (Notice that in this dispute it was Newton who finally won. But I remark that a century and half later, an entire physical theory, thermodynamics, was born by making use of a mathematics that lacked actual infinity).

The historian T.S. Kuhn[27] also suggested a conflictual vision of the history of science, which in his case concerned the development of classical physics as a whole. He thought that science proceeded by constantly applying a paradigm that is shared by the scientists that make up the scientific community. But it may occur that a specific case-study (such as the black-body theory in theoretical physics at the end of the 19th Century) halts the successful applications of this paradigm; such a case-study constitutes a theoretical anomaly, which brings about a scientific revolution, (in the above case-study, the quanta revolution), leading to the replacement, through a Gestalt phenomenon in the minds of the entire scientific community by a new paradigm (the corpuscle-wave complementarity) of the previous paradigm (the continuous vision of reality). Owing to the Gestalt change, the new paradigm proves to be incommensurable with the previous one, with the risk of untranslatability, and even incommunicability, between the two paradigms. In other terms, according to Kuhn, science suffers conflicts between successive paradigms.

However, both Koyré and Kuhn made use of, rather the basic notions of the science itself, some philosophical notions; respectively, infinity; and paradigm, anomaly, revolutions. Hence, their analyses are merely philosophical analyses which are cleverly supported by suggestive historical cases; but they did not achieve scientific proof of the validity of their interpretations.

A more accurate inspection of past science reveals that some scientists also introduced conflicts within science. Already at the end of the 19th Century, Haeckel proposed a new science, i.e.

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[25] A. Koyré: *From the Closed World to the Infinite Universe*, Univ. Maryland, Baltimore, 1957.

[26] This shows that science includes a philosophy. Already a century ago one scholar concluded his investigation into the foundations of science by the following guess??: "Metaphysics they [the scientists] tended more and more to avoid, so far as they could avoid it; so far as not, it became an instrument for their further mathematical conquest of the world". E.A. Burtt: *The Metaphysical Foundations of Modern Science,* Routledge and Kegan, London, 1924, p. 303.

[27] T.S. Kuhn: *The Structure of the Scientific Revolutions*, Chicago U.P., Chicago, 1969.

ecology. It originated from a new, global scientific vision of reality (oikos = home), as opposed to the local, analytic vision of dominant science. It was moreover based on the notion of cycle rather than on either ideal notions (absolute space in Newtonian mechanics) or functional relationships (the field in electromagnetism). Haeckel's theory was almost ignored by the scientific community. But after a century, it was realised that the various kinds of pollution, the result of ecological ignorance of cycles in nature, constituted a threat to human life on the planet. Although reluctantly, the academic world had to inaugurate a specific University curriculum on ecology; however, it conceived the curriculum as the study of a series of analytical techniques, rather than a global scientific method.

More recently, I. Prigogine[28] charged Newtonian mechanics with having led to the catastrophic exploitation of Nature; in order to establish "a new Alliance" with nature it is necessary to understand life, for the first time, scientifically; to this end, he proposed thermodynamics as the more appropriate theory for starting to establish a new, harmonious alliance between mankind and Nature. Such a proposal adds the mathematical theory of chaos, which claims to go beyond the deterministic conception of Newtonian mechanics and hence radically changed the previous scientific conception of the world. In addition to the theory of chaos, Prigogine, together with several other scientists, proposes the mathematical theory of complexity as the new direction of scientific research. In other words, through a new scientific attitude he supported a program of scientific research which would achieve a new kind of scientific development.

Hence, ecology, Prigogine's program and complexity theory propose for the future a vision of scientific progress that will renew that derived from mechanistic science. But they do not clarify the nature of their opposition to traditional science, i.e. whether it is merely cultural and therefore collateral or complementary to traditional science; or whether they are proposing a truly alternative science.

Although they are unable to recognise at what point in the foundations of science there exists a conflict and what its nature is, all the above scientific proposals suggest however some philosophical distinctions, e.g. analytical and global, deterministic or chaotic, simple and complex, etc..

Let us now consider hat the above implies for the notion of *peace*. Both scientific programs, Haeckel's and Prigogine's, involving respect for life and hence outlawing the very ideas of war, enemy and destructive solutions to conflicts, suggest an active process for achieving peace. They

[28] I. Prigogine and I. Stengers: *Order out of Chaos: Man's New Dialogue with Nature,* Flamingo, London, 1984.

imply therefore positive peace, rather than the passive peace suggested by the dominant science.

This radical change in the meaning of peace is in agreement with the non-violent meaning of peace. Such an agreement encourages us to proceed in search of a non-violent, non-killing science. However, non-violence adds to the previous meaning by specifying the global method with which one searches positively for peace; non-violence suggests that in the process of achieving peace in an alternative way to war, it is necessary focus attention not only on the aim, however positive it may be, but above all tools employed, which have to be non-violent if they are to be adequate for achieving the positive aim.

7. The birth of conflict and pluralism in science during the French revolution

A more accurate analysis of Kuhn's history of science does not support one crucial point of his interpretation, i.e. the birth of classical chemistry, which was not determined by any "supra-mechanical aspect";[29] rather, it is well-known that it was the result of a cultural battle against the Newtonian tradition of interpreting chemical affinity through gravitational force. Moreover, a similar analysis does not support Prigogine's thesis that the birth of thermodynamics was no more than "an abortion" of the alternative that he is searching. Rather, past historians have been unable to understand the genius of the founder, Sadi Carnot;[30] moreover, one has to remark that thermodynamics seems at a first glance to be an alternative theory to Newtonian science because it was formalised without actual infinity and all its variables are global in nature. A more accurate historical appraisal is therefore necessary of the origins of these two scientific theories, and, more in general, of the corresponding period of the history of science.

The French Revolution wanted to reform Newton's science, accusing it of being mythical in nature.[31] Lavoisier is known for having done so in chemistry by rejecting Newton's notion of

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[29] Kuhn: *The structure…*, op. cit, ch. 9: "The large body of eighteenth-century literature on chemical affinities and replacement series also derives from this supra-mechanical aspect of Newtonianism. Chemists who believed in these differential attractions between the various chemical species set up previously unimagined experiments and searched for new sorts of reactions. Without the data and the chemical concepts developed in that process, the later work of Lavoisier and, more particularly, of Dalton would be incomprehensible.[8][this footnote refers to the historian Metzger] Changes in the standards governing permissible problems, concepts, and explanations can transform a science." Here it is apparent that Kuhn wants to attribute Lavoisier's foundation of classical chemistry to a "supra-mechanical aspect of Newtonianism". Hence, he does not see any alternative to Newton's mechanics. Otherwise, his conception of the scientific conflict as a conflict between two subsequent?? [successive] paradigms only produced a paradoxical result; classical chemistry was to be considered the new paradigm, succeeding in the subsequent theoretical physics to Newtonian paradigm.

[30] R. Fox: ??? *C.R. Acad. France*, 1980, offers a final appraisal on the research carried out according to the dominant attitude among the historians of this case-study, i.e. interpreting S. Carnot's exceptional [theoretical] novelties by means of technological factors??[by means of technological novelties]????.

[31] C.C. Gillispie: "The *Encyclopédie* and the Jacobinian Philosophy of Science", in M. Clagett (ed.):

affinity as gravitational force). He intentionally published his main book in the same year as the French revolution, 1789; in the introduction he wrote that he sought to bring about a "scientific revolution". Moreover, during this period all scientific theories were founded anew: geometry (Monge, L. Carnot, Poncelet), infinitesimal calculus (L. Carnot, Lagrange), mathematized mechanics (L. Carnot, Lagrange, Navier, Poisson) and, in addition, thermodynamics was born (S. Carnot).[32] Moreover, historians evaluate the revolution in geometry, i.e. Lobachevsky's invention of non-Euclidean geometry in the remote Kazan University, as a long-term consequence of the French revolution.[33]

A leading figure of this renewal of science was L. Carnot. In opposition to celestial mechanics (the best application of Newton's mechanics, which relies upon the metaphysical notions of absolute space and absolute time), he founded terrestrial mechanics (dealing with the impacts of bodies; and more precisely, the mechanics of machines; notice that each of them is a complex aggregate of bodies, which was considered by L. Carnot globally); he founded the theory on the practical concept of work and not on the metaphysical one of force-cause. Moreover, he re-formulated both the mathematical theories of his times, i.e. geometry and infinitesimal calculus, in an alternative way; furthermore, he suggested to his son Sadi the key ideas that gave rise to thermodynamics, whose theoretical structure is very different from that of Newton's theory.[34]

Critical Problems in the History of Science, Wisconsin U.P., 1962, pages 255-269.

[32] A. Drago: "The alternative science of the Enlightenment", *Studies on Voltaire and the Eighteenth Century 348, Trans. Ninth Int. Congr. on the Enlightenment, Münster 1995*, 1997, 1081-1805; "History of the relationships Chemistry-Mathematics", *Fresenius J. Anal. Chem.* **337** (1990), 220-224. Erratum, *ibidem,* **340** (1991), 787; "A new appraisal of old formulations of mechanics", *Am. J. Phys.*, **72** (3) 2004, 407-9; "Sadi Carnot e la nascita di una nuova scienza", *Atti del III Congresso Nazionale di Storia della Fisica*, op. cit., pages 460-465; "The introduction of the Cycle Method in Thermodynamics", in K. Martinas, L. Ropolyi, P. Szegedi (eds.): *Thermodynamics: History and Philosophy. Facts, Trend, Debates,* World Scientific, Singapore, 1991, 36-41 (with A. Della Selva).

[33] A. Yushkevitch: "French Mathematics in Russia", in USSR Acad. Sci.: *Science and Society*, Nauka, Moscow, 1989, 212-228. A. Drago: "The beginnings of a pluralist history of mathematics: L. Carnot and Lobachevsky", *In Memoriam N. I. Lobachevskii,* **3**, pt. 2 (1995) 134-144; S. Cicenia and A. Drago: "The organizational structures of geometry in Euclid, L. Carnot and Lobachevsky. An analysis of Lobachevsky' s works", *ibidem*, 116-124.

[34] The works by L. Carnot referred to are the following: *Essai sur les machines en général*, Dijon 1783; *Principes fondamentales de l'équilibre et du mouvement*, Deterville, Paris 1803; *Réflexions sur la metaphysique du calcul infinitesimal*, third edition, Courcier, Paris, 1813; *Géométrie de position*, Paris 1803. A first comprehensive study of Carnot's work is C.C. Gillispie: *Lazare Carnot Savant*, Princeton U.P., 1971. About the scientific relationship between the two Carnot's see ch. III D. Notice that L. Carnot's theory (which tackles an extremely complex situation, constituted by a machine composed of an unlimited number of levers, wheels and impacting parts), and even more so S. Carnot's theory (which tackles the complexity of a gas, where there is a jumble of millions of billions of billions of molecules mutually impacting), show that a complex situation may be easily solved in scientific terms when the appropriate theoretical parameters are recognised. In fact, the aforesaid theories have abandoned the analytical attitude (a typical feature of Newtonian mechanistic physics) of examining the single parts, or molecules, composing a system, and instead proceed to assess the situation using global parameters such as energy, volume, temperature and gas pressure. These theories were the beginning of a conflict with Newtonian theory, hence a conflict between the various physical theories. Notice that nothing is more complex than a conflict, because it is always changeable and unforeseeable in all its implications. Hence, the birth of complexity theory, underlining the complex phenomena which

L. Carnot's main scientific achievement was to suggest an alternative to the dominant organization of a scientific theory. Instead of the pyramidal organization (which we find by Aristotle and then in both Euclid and Newton; at the top it puts "evident" principles, from which all laws are deductively drawn; we will call it AO). L. Carnot's new kind of organisation (we will call it PO) is centred on a general problem (in mechanics: that of finding the invariant quantities during a phenomenon of an impact), to which the development of the theory finds a general solution.[35]

Also S. Carnot founded thermodynamics by posing a central problem (maximum efficiency in energy transformations); and by then finding a new method (Carnot cycles) that solves this problem.

The discovery of two ways of organizing a scientific theory suggested to L. Carnot a pluralistic attitude towards the foundations of science. He clarified it in infinitesimal analysis. In this theory he accepted and supported all the various foundations of analysis on the basis of a pluralistic attitude. His book received wide popular acclaim, but was then dismissed by the "war-like" attitude of the academic world of the subsequent age, according to which in any scientific theory proposed – if only for didactic reasons - there was only one foundation which cancelled out all others.

Soon after the French revolution in a remote town in Russia, Kazan, Lobacevsky (who had studied French books) was able to propose a new kind of geometry. He did not just change a single postulate (the fifth), but posed the problem of how many parallel lines there are and put forward an original method for solving it. He thus changed the entire theoretical framework of Euclidean geometry.[36]. A few decades after the failure of the French Revolution, the labour movement (unfortunately ignoring the new scientific theories) wanted to start an alternative theory in social sciences. Marx's theory tackled the central problem of how to overcome capitalism in the history of

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have to be formalised by a non-local, non-analytical attitude, may be seen as the first approach to notion of conflicts between scientific theories; in my opinion, such complexity is more relevant than complexity in reality. The weakness of present complexity theory appears also when one considers that it does not make a clear choice between the analytical and the global attitude.

[35] See the lucid presentation of the alternative in the organization of a scientific theory, although he qualified as "empirical" the OP. L. Carnot: *Essai, op. cit.* , pp. 101-103 and *Principes*, op. cit. pp. xii-xix. A. Drago: "A new appraisal…", op. cit. Independently both H. Poincaré and A. Einstein arrived at the same result. H. Poincaré: *La science et l'Hypothèse*, Flammarion, Paris, 1903, Ch. "Optique et Electricité"; *La Valeur de la Science*, Paris, 1905, Ch. Vii.; A. Einstein: *Ideas and Opinions*, 1957. A.I. Miller: *A. Einstein's special theory of relativity*, Addison-Wesley, 1981, 123-142.

[36] A. Drago: "The beginnings of a pluralist history of mathematics: L. Carnot and Lobachevsky", *In Memoriam N. I. Lobachevskii,* **3**, pt. 2 (1995) 134-144; S. Cicenia and A. Drago: "The organizational structures of geometry in Euclid, L. Carnot and Lobachevsky. An analysis of Lobachevsky' s works", *ibidem*, 116-124. A. Drago e A. Perno: "La teoria geometrica delle parallele impostata coerentemente su un problema", *Per. Matem.*, 4 (2004) 41-52. V.A. Bazhanov and A. Drago: "A Logical Analysis of Lobachevsky's Geometrical Theory", submitted to *Historia Mathematica*.

mankind; first he studied the relationships between factory owner and workers, rather than that between buying and selling in the market; then through his studies he sought a new political method, based on scientific principles, for bringing about the social revolution.

I would also point out that the both Carnot's and Lobachevsky's theories are alternative not only in their organization, but also in their use of mathematics; instead of Newton's (metaphysical) infinitesimal calculus, which includes actual infinity (or its inverse, the infinitesimal *dx*), they make use of a mathematics that is appropriate for operative calculations, i.e. it relies on potential infinity only. We might conclude that the French revolution gave rise historically to pluralism in scientific theories.

What was the relationship in this period between science and conflict (war)? Over the centuries, science has always been exploited for war purposes.[37] However, an alternative attitude came into being during the French revolution. The military devoted itself to improving civil society. In other words. at that time there was a process of conversion of those working in the military to civil purposes. Most of the new scientific theories of the French revolution were the work of military scientists: Monge, L. Carnot, Poncelet, Navier, Poisson; in particular thermodynamics was born almost entirely when the former soldier S. Carnot turned his attention from cannons, mythologised as having almost unlimited power, to civil machines, which he studied from the point of view of maximizing their efficiency.[38]

On the other hand, during the French revolution civil society wanted to apply human reason to social life as a whole, in particular to creating an alternative State to the old absolute, metaphysical State (recall the blue blood of the kings!).

In fact, the French revolution succeeded (notice, before Napoleon) in reforming the State's military sector. It turned the mythical military structure of the aristocracy, which aimed at the kingdom's expansion, into an institution that was an expression of the people's will simply to defend civil society. Indeed in 1793, when the European monarchies united against revolutionary France, a military structure was rapidly re-built by means of the first great "levée en masse"; it was launched by the supreme head of the French army, Lazare Carnot. With a military background, he before 1789 had theorized the new strategic theory of total (popular) defence (as opposed to the ideology of 'total war' that had just come into being). In 1793 he successfully applied this strategy

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[37] For a general view, see J.U. Nef: *War and Human Progress*, Harvard U.P., Cambridge, 1952. A relevant exception was C. Huygens who wanted to exploit cannon powder for building an engine.

[38] G. Salio: "S. Carnot, la nascita della termodinamica e le tecnologie belliche", *Atti del III Congresso Nazionale di Storia della Fisica*, op. cit., 236-241.

to defending democracy. The French people, although weaker in destructive weapons, achieved "Victoire".

Exactly two centuries later, in 1989 the peoples that freed themselves from the dictatorships of Eastern Europe reiterated this policy of people's defence and defeated a super-power which was ready for the greatest destructive confrontation in mankind's history. The French Revolution had therefore anticipated the only possible alternative we have today to the mythical and disastrous arms' race, i.e. collective defence only; and moreover a defence that is not entrusted to the mythical destructive power of an enormous military arsenal, but to the solidarity of a population wanting to protect both itself and its democratic institutions. Hence, in national defence there exists an historical tradition which constitutes an alternative to merely destructive defence, of which nuclear defence is an example.

More in general, in the history of the relationship between science and war, the link between the dominant science and the development of ever more destructive weapons is clear. However, the French revolution established a new, alternative link; even extreme conflicts are solved in the wisest way, as it was exemplified by Gandhi first and in the 20th Century by many other peoples. What is extraordinary in the French revolution is that the new notion of defence was developed by individuals from the military.

But in the following period, the policy of the Restoration was to present science as it had been before French revolution, i.e. without internal conflicts, and to outlaw many scientific theories. After 1850, when the bourgeoisie took the social power, most of them were rehabilitated; but some of the previous theories have never been accepted[39]; in particular, Marx's theory; but also some "revolutionary" scientific theories (e.g. those of L. Carnot). On the other hand, Lavoisier's chemical theory survived despite academic opposition, because it was supported by chemists and chemical engineers, who were indispensable to contemporary society. [40]

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[39] Indeed, the Restoration institutionalized academic science according to a number of authoritarian constraints: 1) the setting up of scientific academies with rigid professional roles; 2) "rigorous" procedures to communicate and accept scientific results; 3) embedding science in a sophisticated (mathematical) language which acted as a barrier against those who wished to discuss fundamental problems; 4) splitting up scientific work in several fields, that are sharply separated one from another (e.g. economics from physics, in particular thermodynamics; mathematics from computing machines, etc.); 5) maintaining scientificity as the final criterion also for solving social issues; that is, a monolithic science set above all other social values. See J. Ben-David: *The Scientist's Role in Society,* U. Chicago Press, Chicago, 1974.

[40] Three decades ago an alternative within scientific theories was suggested by an important social problem, i.e, the energy crisis which recalled the scientific alternative of one century and half earlier. Owing to the oil crisis of 1973, the Western world discovered that as a society it had never taken into account energy consumption and energy waste. In reaction, the dominant scientific attitude foresaw the same rate of progress as in previous years, i.e. an exponential growth of energy consumption; as a consequence, society had to produce a huge amount of energy (mainly

8. Formally qualifying the conflicts within Science

We have considered some conflicts concerning the history and the philosophy of science; there have even more decisive conflicts within science after an acute crisis in the first years of the 20th Century, through studies investigating the internal structure of science, that is, the foundations of both mathematics and logic.

The studies of the foundations of mathematics recognised an essential conflict between two kinds of mathematics; i.e. the dominant mathematics that is taught in scientific Faculties and includes actual infinity (which we will call AI), and the mathematics that makes use of potential infinity only (we will call it PI); the latter mathematics is closely approximated by the mathematics that represents the working of the computer. Four decades ago this conflict was formally founded.[41]

As evidence for this alternative mathematics(?), it should be noted that past mathematics, being metaphysical in nature owing to the use of actual infinity in several specific notions, such as infinitesimals, never dealt with conflicts before World War I; i.e. two centuries and half after the birth of infinitesimal analysis, some scientists succeeded in doing so when they discovered that two coupled difference or differential equations describe phenomena of mutual competition, including the arms' race. Euler could have developed this theory two centuries before, if he had not prejudiced by the idealistic nature of the dominant mathematics. Between the two World Wars game theory was born; it analyses in detail the aspects of a conflict by means of few integer

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electrical). It seemed that nuclear power, developed thanks to most advanced modern scientific theory, i. e. nuclear physics, could guarantee such levels of production. It was presented as the only viable solution and its opponents were not credited with rationality. Yet surprisingly,the second principle of the older theory of thermodynamics contradicted the development of nuclear power. The American Physical Society discovered that, strangely enough, for over one hundred and fifty years Western society had not applied the specific scientific theory of energy, i.e. thermodynamics; whose central idea is that in any energy transformation the optimum yield is given by a S. Carnot cycle, whose efficiency depends on the difference between the temperatures of the heat source and the temperature of the final use; hence, it would be wise to choose that energy source whose temperature is as close as possible to the temperature of the final use. By disregarding this principle, the present social organization systematically leads to an enormous waste of energy. APS Study Group: "Efficient use of Energy", *Phys. Today*, **26** Aug. 1976, 23-33. The alternative energy planing chooses low temperature, renewable sources of energy, because they are the more suited to the final use of energy at local level. Hence, the question: "How much energy?" was followed by the question: "What kind of energy?" The debate made it clear that there exists a distinction between two radically different ways of producing energy for a society. US Senate: *Long-term energy planning*, 1975; A. Lovins: *Soft Energy Paths: Toward a Durable Peace,* Penguin Books, Harmondsworth, 19**77.** One may trace back the internal conflict within technology to S. Carnot who began his booklet on thermodynamic discussing energy planning for a society; moreover, he warned of energy crises and foresaw the great change in future society brought about by the widespread use of heat engines; and even more important, he suggested the criteria for achieving the greatest efficiency in energy transformations.

[41] E. Bishop: *Constructive Analysis*, Mc Graw-Hill, New York, 1967. Notice that the dominant mathematics, the so-called "rigorous" mathematics which was developed by both Cauchy and Weierstrass in the 19th Century, includes actual infinity even in the basic notion of limit. See F.G Kogbetlianz: *Fundamentals of Mathematics from an Advanced Point of View*, Gordon and Breach, New York, 1968, App. 2.

numbers; the mathematical technique is so elementary that even Archimedes or Galileo had the technical capabilities to develop it.[42]

As an important consequence, game theory inaugurated a new mathematical relationship with reality which is alternative to the relationship established by Newton's theoretical physics; instead of the metaphysical mathematics of the infinitesimals, it makes use of the more elementary theory of constructive mathematics, i.e. the theory of integer numbers.

It should be noted that almost in the same period of the birth of game theory, theoretical physics too had to admit that all reality is constituted, in a 'complementary' way to waves, by quanta which require the mathematics of integer numbers; and soon after game theory, theoretical biology also came about in association with discrete mathematics (e.g., a neuron as a two-state switch, the constitution of DNA by an integer number of bases, etc.) all outside continuous mathematics and even more outside the AI. Since that time a conflict was apparent between the new scientific theories and traditional science linked to the idealised mathematical continuum (including AI; for instance, the notion of infinitesimals).

In the above we have already seen that this novelty was anticipated by science during the French revolution. Chemistry was born from the mathematics of integer numbers; and more in general both L. Carnot's mechanics and S. Carnot's thermodynamics made use of the mathematics of the PI only.

At the end of the 19th Century logic was confident that, having been mathematicized, it had achieved an absolute nature. Nevertheless, at the beginning of 20th Century a conflict also arose in mathematical logic; in addition to classical logic, several kinds of different mathematical logics were discovered.

In particular, it was discovered that it is not the law of the excluded middle (either 'A is true' or 'not-A is true'), but the law of double negation ("Two negatives affirm"); this distinction constitutes the borderline between classical logic and almost all the kinds of non-classical logic; in the latter kinds of logic two negations do not affirm (for an example: "Absolved owing to the lack of evidence of guilt" does not mean that the accused person is clean-handed, but that the court had insufficient evidence to establish whether he was guilty or not). Hence, mathematical logic is split into (at least) two incompatible branches.[43]

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[42] J.R. Newmann (ed.): *The World of Mathematics*, vol. 4 Simon & Schuster, New York, 1956. A. Rapoport: *Strategy and Conscience*, Harper, New York, 1964. A celebrated application of Rapoport's cleverly describes the arms' race, carried on by the two super-powers, through the game of prisoner's dilemma.

[43] M. Dummett: *Elements of Intuitionism*, Oxford U.P., 1977. D. Prawitz and P.-E. Melmnaas: "A survey of some

Again one can trace back the use of non-classical logic to some centuries before, in particular to some scientists of the period of French revolution. In their original scientific works one finds several sentences which are doubly negated statements of non-classical logic: "We call element what we could not yet decompose" (Lavoisier); "A never ending motion is impossible" (L. Carnot and S. Carnot); “This hypothesis [of two parallel lines to a given one] does not lead to any contradiction” (Lobachevsky); "These two postulates [constancy of the light speed and relativity] are only apparently irreconcilable" (Einstein); "One cannot simultaneously measure an object's position and speed with absolute [= not relative] accuracy" (Heisenberg). Each of them play a fundamental role in the respective scientific theory.

It is precisely on this logical point that the enormous experience of Freud, who founded the theory of inner conflicts, was based. He explained his method in a paper of a few pages.[44] He points out that the analyst asks the patient to speak freely about say, what he dreamt. The patient tells a dream; he met his mother; but a dispute arose and he, in a fit of rage, nearly killed her; but then he urges: “I did not want to kill her”. The analyst must notice this negation and, in turn, has to add one more negation: “It is not true that the patient did not want to kill his mother”.

The doubly negated sentence provides the clue to recognising the trauma that the patient has repressed in the past (i.e. denied in his inner self), which, however, emerges again and again. This enables the analyst to recognise the repressed part of the patient and hence to start the healing process.[45] Let us remark that Freud’s whole theory is in agreement with the PO theory; he poses the problem of the patient’s healing, then solves it through the invention of a new method, which interprets the dialogue inductively through doubly negated sentences constructed upon the patient’s negated sentences.

Non-classical logic plays a fundamental role also in conflict resolution when it is considered in general terms. Let us recall that the great discovery of the 20th Century was the non-violent method. In fact, the very term non-violence is a double negation (violence being a negation of life); notice that it does not have a positive equivalent (notwithstanding Gandhi’s efforts to substitute for it the affirmative word “satyagraha”); thus, the two negations do not affirm. On the contrary, the military way of theorising the resolution of a conflict in the barracks makes use of classical logic, enforcing

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connections between classical intuitionistic and minimal logic”, in H. A. Schmidt, K. Schuette and H.-J. Thiele (eds.): *Contributions to Mathematical Logic,* North-Holland, Amsterdam, 1968, pp. 215-229. In the following I underline the negative words in a doubly negated statement in order to show its nature.

[44] S. Freud: “Die Verneinung”, *Imago*, **11** (3) (1925) 217-221.

[45] It is well-known that also the theoretician of social conflicts, i.e. Marx, tried, by turning up it Hegel’s metaphysical dialectics, to obtain a new logical way of arguing; but unsuccessfully, although he made use of many double negations.

absolute certainties: “The enemy of my enemy is my friend” where the two negations affirm; and also of the equivalent logical law of the excluded middle: “Either friend or foe”, “Either patriot or stranger”, “Either obedience or disobedience”, etc..

Hence, unlike the classical logic of the military, the word “non-violence” introduces an entirely new way of reasoning with respect to the dominant one. This fact is also apparent in logical terms; indeed, classical logic guarantees rigorous deductions, whereas non-classical logic is the basis of inductive arguing.

Since both logic and mathematics are the foundations of all branches of science, from the above two kinds of conflicts it follows that there is a fundamental division within science as a whole, giving rise to intellectual conflict.[46]

Such a division within both logic and mathematics generates divisions within each scientific theory through both the plurality of its formulations and the radical variations in meanings of its basic notions when changing the formulation of the theory and even more when changing the theory itself. For instance in geometry, a straight line conceived of either as an infinitely prolonged segment (Euclid and Lobachevsky) or as possessing two end points (Hilbert); in theoretical physics, either absolute (in Newton’s mechanics) space or relative space (in L. Carnot’s mechanics, and even more in special relativity); continuous time and time as before and after (in the same two different formulations) and even space-time (in special relativity for which, moreover, mass fuses with energy); the classical notions of both wave and corpuscle playing complementary roles in quantum mechanics, etc.

Notice that the two different logical worlds are mutually incompatible in their basic tenets. But, each doubly negated sentence is an open sentence; hence, non-classical logic is not exclusive in nature - as is classical logic; let us recall military logic -; it allows mutual dialogue and co-existence, that is, it introduces a fundamental pluralism.

9. A verification: Pluralism in stating the inertia principle

The clearest demonstration that science as a whole diverges with regard to its formal

[46] We have already remarked that in the energy debate, involving essentially scientific principles, there were two different and irreconcilable positions, of equal scientific validity; i.e. nuclear energy planning and soft-energy planning. In fact, a similar division occurred in each applied scientific sector. A similar division is clear in agriculture, between chemical-industrial agriculture on the one hand, and organic, biodynamic (or permacultural) agriculture etc., on the other. A similar division also exists in the health sector, between the dominant bio-chemical medicine and homeopathy, or acupuncture, or herbal medicine, etc.. In general terms, “alternative technologies” were invented(?*but surely acupuncture precedes modern science!)* and were claimed to be independent of traditional technologies. There is no easy definition of these alternatives; however some instances are the bicycle instead of the motor car, wooden instead of concrete houses, solar panels instead of the electricity for heating water.

foundations is obtained by an examination of the inertia principle, which, being the starting pointing the most important theory of traditional science, Newton's mechanics, represents the beginning of modern science.

Descartes-Newton's version is: "Every body perseveres in its state of being at rest, or of moving uniformly forward in a straight line, except insofar as it is compelled to change its state by a force acting on it".[47] An alternative version was suggested by (again!) L. Carnot: "Once a body is at rest, it will not move by itself; once it is in motion, it will not change either its speed or its direction"[48] (where changing and moving are the negation of "rest", the only situation which does not require scientific explanations).[49] It is worth noting that L. Carnot's doubly negated sentence (e.g. not move) does not have a corresponding positive word in science; in fact, in order to be able to express the same idea positively, Newton makes use of the verb "to persevere" (or sometimes "to continue"), which is clearly a moral and animistic word. Here we have a drastic alternative about which kind of logic, either classical or non-classical, shapes a theory. Being a basic principle, the version of the inertia principle determines the entire organisation of the subsequent development of the theory; Descartes-Newton's version is an AO of mechanics, whereas L. Carnot's version a PO.

In addition, it is worth noting that Newton wrote: "Every body...": these two words include even the bodies that we will discover in the future; here we recognise an *infinity in action*. Which he also appeals to when he wants to establish with total accuracy – i.e. an accuracy which implies the actual infinity - when a force is impressed upon the body or not, if the body is absolutely at rest or not, if the motion is perfectly rectilinear or not, and perfectly uniform or not; and if the distance that the body covers is infinite or not.[50] All these qualifications require such accuracy as to sever the null value of each of the above magnitudes from any other value, however little; they require not an unlimited infinity, but an actual infinity. All the above qualifications are avoided by Carnot's version of the inertia principle, which instead includes only the typical properties detectable by experimental physics, i.e. the only ones that are operational and calculable; that is, those which do not use actual infinity.

Being a basic principle, the inertia principle establishes the kind of mathematics of the

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47 I. Newton: *Philosophiae Naturalis Principia Mathematica*, London 1687, p. 12.

48 L. Carnot: *Principes fondamentaux de l'équilibre et du mouvement*, Deterville, Paris, 1803, p. 49.

49 This remark was made by R.N. Hanson ("Newton's first Law. A Philosopher's door in Natural Philosophy", in R.G. Colodny (ed.): *Beyond the edge of certainty*, Prentice-Hall, 1965, 6-28) who ingeniously produced an almost exhaustive analysis of the inertia principle. See also A. Drago: "A Characterization of the Newtonian Paradigm", in P.B. Scheurer, G. Debrock (eds.): *Newton's Scientific and Philosophical Legacy,* Kluwer Acad. P., 1988, 239-252.

50 R.N. Hanson: "Newton's first Law… "op. cit.

subsequent development of the theory; Descartes-Newton's version mathematics with AI and L. Carnot's version mathematics with the PI.

In the history of mechanics this kind of alternative theory of mechanics had already been put forward by Leibniz.[51] He moreover added two basic ideas. First, in the human mind there exist "two labyrinths of human reason". One is about infinity, either actual or simply potential. We recognise that in our times the first labyrinth was formalized by the option concerning the kind of mathematics, either the classical or the constructive. The other dilemma is between "law" (i.e. to behave according to some a priori principles) and "free will" (i.e. to investigate heuristically); we recognise that at the present time this second labyrinth is formalised by the option concerning the way of organizing a theory, either by using a few abstract principles from which all laws may be rigorously derived, as theorems, by means of classical logic; or organizing a theory to search inductively for a new method for solving a general problem.

Leibniz suggested also that there are two basic principles of the human mind: the principle of non-contradiction and the principle of sufficient reason; the latter was stated by him with the following words: "Nothing is without reason";[52] really, a doubly negated sentence. We recognise that he was suggesting the two basic principles of the two different kinds of logic, respectively the classical and the non-classical. In short, the two dilemmas that Leibniz cleverly recognised, represent, although in no more than philosophical terms (i.e. infinity and organization), the two above-illustrated basic options, which at the present time are well formalized in, respectively, mathematics and logic.

Every theory chooses one of these two options. Being two independent dimensions, when we cross them we divide the space of all theories in four quadrants and each may be considered as representing a particular *model for scientific theories*.[53] Being severed one from the other by

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[51] A. Drago: "The birth of an alternative mechanics: Leibniz' principle of sufficient reason", in H. Poser et al. (eds.): *Leibniz-Kongress. Nihil Sine Ratione***,** 2001, Berlin, vol. I, 322-330; *La riforma della dinamica di G.W. Leibniz*, Hevelius, Benevento, 2003. In retrospect, Leibniz' mechanics lacks two theoretical improvements; the introduction of the index of elasticity and the principle of virtual velocities (which was formulated by Bernoulli one year after Leibniz's death).

[52] G.W. Leibniz: "Letter" to Arnaud, 14/7/1686. As an improvement of Leibniz' philosophy of science, see A. Drago: "The modern fulfilment of Leibniz' program for a *Scientia generalis*", in H. Breger (ed.): *VI Int. Kongress: Leibniz und Europa,* Hannover, 1994, 185-195. In particular, Popper's celebrated philosophy of science is interpreted as a new attitude inasmuch as it first made an implicit use of non-classical logic: A. Drago and A. Venezia: "Popper's falsificationism interpreted by non-classical Logic", *Epistemologia*, 30 (2007) 235-264.

[53] See A. Drago: "Mathematics and alternative theoretical physics: The method for linking them together", *Epistemologia*, **19** (1996) 33-50. A crucial philosophical notion proves to be the incommensurability between two theories. A. Drago: "Incommensurability as a bound???? of hermeneutics in science", in M. Fehér, O. Kiss, L. Ropolyi (eds.): *Hermeneutics and Science*, Kluwer Acad. P., 1999, 135-155. "Mathematics and alternative theoretical physics", op. cit. Nowadays many think of science as a variety of "scientific models" by means of which one sketches

mutually conflictual choices, these four models represent a well-rooted pluralism in science. Moreover, the two options provide the human mind with the cardinal points of a compass by which it is oriented among the innumerable theories of modern world. In such a way one obtains an answer to the problem put by Lanza del Vasto (see §. 5); a person can obtain a comprehensive knowledge of science.

10. Away from monopolies in both science and national defence

The general conclusion is that, despite the changes brought about by the French Revolution, for two hundred years the scientists' community refused to consider the internal conflicts in science. Tenaciously scientists presented Science as a monolithic construction with no possible alternatives, i.e. as the only possibility for all activities and human thoughts to be "at peace". This undisturbed science claimed to be capable of reconciling all social conflicts: for example, in the early years of the 20th Century, Science claimed to be capable of reconciling social conflicts in the factory system by introducing Taylor's scientific principles for evaluating human labour equitably; between the '50s and the '80s science claimed that it could reconcile the East-West clash through scientists' superior formulae on disarmament. In the '70s science imposed nuclear power; in solving the problem of energy planning, they wanted to guarantee mankind universal welfare and therefore peace. These solutions (the choice of nuclear power was justified by the belief that science is making the greatest rational effort possible to avoid such internal conflicts.

Let us recall that Galtung's important distinction between three types of violence: personal, cultural and structural. We see that the dominant science falls within cultural violence, not only because it justifies structural violence but also because it monopolizes the truth by means of its results, which are obtained regardless of human life, presenting itself as the only, unquestioned solution to human problems. The *violence of science consists, more than in justifying structural violence and war, in its claim to monopolise the truth on any subject, including wars*. All of which was dictated by the motto (which parallels the old Catholic Church's motto,: "Nulla salus extra hanc Ecclesiam"; No salvation outside this Church; which monopolises souls): "Nulla ratio extra hanc scientiam" (No reason outside this science), which monopolises human reason.[54]

And indeed, notwithstanding the scientists' formulae, the factory conflicts, the East-West clash

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reality. In the present paper the word "model" has a more precise meaning; here, there are four models only, each having its own peculiar features, which can be traced back to a pair of choices regarding the two options, which constitute the foundations of science.

[54] My motto sums up the paper by K. Feyerabend: "Philosophy of Science 2001", in R.S. Cohen, M. Wartofsky (eds.): *Methodology, Metaphysics and the History of Science*, Reidel, 1984, 137-147.

and the energy problem have persisted, showing that historically the initiatives of modern science look like a huge, terrible deception, even a form of subservience to a super-human power, as Lanza del Vasto suggested.

What I have shown above regarding the foundations of science leads precisely to the opposite conclusion to that of the blief in the peaceful science, i.e. *the fundamental nature of science is conflict*, owing to the options regarding its foundations. In the previous sections I argued that at least through the different versions of the inertia principle, science does not have a monopoly of the truth; every single scientific theory (even mechanics) is divided in formally alternative formulations.[55]

But even at the present time the dominant science hides such a conflictual nature by presenting one truth only, which actually is just the truth of the dominant model of scientific theory, which in turn in corresponds to the dominant power in society. Thus it is necessary to dethrone the cultural violence which is operated by science which monopolizes truth and claims, in a pre-conceived manner, to bring peace. In order to understand how to achieve peace we need to find a new scientific approach which will generalize the solutions to conflicts concerning the foundations of science; i.e. we have to change from the paradigm of the monopoly of the truth to the pluralism of the four models of scientific theory.

11. Formalising the alternative in national defence and in conflict resolution

In the last decades several authors have supported the idea of an alternative to destructive nuclear capacity. Some of them even proposed a non-violent strategy in national defence; against nuclear weapons they set people's non-collaboration and non-violent mass demonstrations.[56] Then as a matter of fact the 1989 non-violent revolutions against the Yalta division based on the nuclear threat occurred in both China and successfully in Eastern European countries.

However, going beyond historical events, is there a possible alternative rationality to that underlying both military institutions and its conflict resolutions? What kind of rationality would it be?

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[55] Of course, the alternative science does not concern the experimental laws, but only the foundations of a scientific theory; i.e. the the mathematical techniques for formalising the experimental laws, the theoretical principle for understanding them systematically, the organization of them and the logic for arguing about them.

[56] Let us recall S. King-Hall: *Defence in a Nuclear Age*, Gollancz, London, 1958. Then non-violent defence was supported by A. *Boserup and A. Mack: War without Weapons,* Pinter P., London, 1974; T. Ebert: *Die Soziale Verteidigung*, Waldchircher V., Waldchirche, 1981; J. Galtung: *There are Alternatives!*, Pluto P., London, 1984; G. Sharp: *Making Europe Unconquerable: The Potential of Civilian-Based Deterrence and Defence*, Ballinger P., Cambridge Massachusetts, 1985; A. Drago: *La difesa Popolare Nonviolenta*, EGA, Torino, 2006.

Let us remark that, owing to the mechanical effects of military technology (even those involving other scientific theories, i.e. chemistry, electromagnetism, nuclear theory, etc.), the military appeals to the rationality of the dominant mechanics.[57] But in §. 8 we saw, through the two versions of the inertia principle, that there exists an alternative in mechanics; and, more in general, there are alternative formulations for each scientific theory.

A possible objection is that the alternative inertia principle, L. Carnot's, because it belongs to a mechanics based on impacts, necessarily concerns violent events. But, the history of impact theory in physics is almost unknown .[58] At the beginnings of modern science Wallis suggested that in order to formalise the impact of bodies one had to refer to the ideal model of a perfectly hard body, whose shape never changes (Newton agreed; he thought that God created the World that was constituted by hard bodies, which in time were transformed into soft bodies). The perfect hardness of the ideal body did not allowed resilience; hence the conservation of energy, as a general law, was considered invalid for two centuries.

But Leibniz objected that in human relationships it is desirable to behave flexibly; hence, the most suitable model of the theory of the impact of bodies is the perfectly elastic body; owing to its resilience, the impacts among bodies of this kind conserve energy and other quantities (momentum, momentum of momentum) that the bodies have in common; so that in the new idealisation the impact is no longer a macho clash, but a mutual exchange of these three common quantities. The birth of thermodynamics(1850) was necessary for the conservation of energy to be established as a general law, and, as a consequence, Leibniz's model of elastic impact. Here we have an instance of positive scientific progress promoting non-violence, since Leibniz-L. Carnot's mechanics, which is based upon the elastic impact, is a non-violence-oriented theory rather than the Newtonian theory of the hard bodies which is a macho-oriented theory of impact.

Is this kind of rationality relevant to national defence? One of the greatest strategists of all times was (again!) L. Carnot. His strategy was an exclusively defensive defence; which relied upon the use of strongholds, since they "oblige the enemy to fight against bastions and walls, rather than

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[57] For a link between mechanics and social thinking in general, see S. Haret: *Méchanique sociale*, Gauthier-Villars, Paris, 1932; G. Freudenthal: *Atom And Individual In The Age Of Newton: On The Genesis Of The Mechanistic World View*, Boston Studies in Philosophy of Science n. 88, Reidel, Boston, 1986.

[58] For the basic notions, see W.L. Scott. *The Conflict between Atomism and the Conservation Laws*, 1600-1860, Elsevier,
Amsterdam, 1971. For Leibniz' basic remark see G.W. Leibniz: Letter to Lambert van Velthuysen, may 1671. For the general considerations see my paper: "When the history of Physics teaches non-violence: The impact of bodies as a metaphor of conflict resolution", *Nonviolence and Spirituality*, n. 3, 1996, 15-22.

human beings".[59] Moreover, he theorised strongholds as machines, to which he applied his formula for the highest efficiency, based upon the conservation of energy.[60]

Surely, after the failure of the Maginot line L. Carnot's defensive strategy has to be changed. But we can retain L. Carnot's basic scientific notion, i.e. that of the greatest efficiency. It is determined by acting in a reversible manner; i.e. never perform an action that cannot be subsequently reversed without loss of work. Such a notion constitutes a representation of the gentle way that is necessary to solve a conflict through consensus. In weaker terms, this imperative constitutes the precautionary imperative, which is strongly supported by the ecologist movement.

This notion of maximum efficiency was then applied by his son, Sadi, giving rise to thermodynamics. By going beyond S. Carnot's partial results, we recall that in thermodynamics the greatest efficiency means the minimum of the entropy change ($\Delta S = min$). This idea was already stated in the social sciences as the 'thermodynamic imperative' and it was emphasised as being able to address the whole of social life.[61] When we apply this imperative to conflict resolution, in specific wars, it dictates the minimum cost of human lives, since the death of a human being is the most irreversible process.[62]

Moreover, given that entropy is the notion that approximates most to the notion of the disorganisation of a system, we can translate the above formula as the minimum of change towards disorganisation in the system. Now such an imperative no longer implies the defence of something material, i.e. the stronghold, but of democratic social institutions; precisely what the German term for alternative defence (*Soziale Verteidigung*) emphasises. In short, such a scientific formula appears to human reason to be the best imperative even with regard to national defence.

Which kind of general rationality then results? First, the rationality of making use not of absolute tools (AI), such as nuclear weapons; but above all interpersonal relationships, which are merely unlimited tools. Secondly, the rationality of the alternative in organisation (OP), which in social terms means a self-reliant organisation that aims to solve an important social problem: in our case, a people's defence.

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[59] It is the main notion of L. Carnot's: "Eloge de Vauban", in J.P. Charnay (ed.): *Lazare Carnot. Mathématique et Révolution*, La Herne, Paris, vol. 2, 1985.

[60] This formula states the equality of the work done from the outside and the work of resistance performed the machine; work being defined as the force times velocity times the time, we have the formula *FVT=fvt*. From it one sees that the main advantage of a stronghold is to oblige the besieger to act more rapidly than the besieged; so that a smaller number of besieged persons are able to resist a greater number of besiegers.

[61] R.B. Linsday: "Physics, Ethics and the Thermodynamic imperative", in W.L. Reese (ed.): *Philosophy of Science*, vol. 2, Interscience, 1963, 428-448.

[62] A. Drago and A. Sasso: "Entropia e difesa", in A. Drago and G. Stefani (eds.): *Una strategia di Pace: La Difesa Popolare Nonviolenta*, FuoriTHEMA, Bologna, 1993, 153- 161.

It is not so surprising that this kind of rationality was anticipated by some of the greatest strategists: Sun Tzu, L. Carnot and Clausewitz. They wrote books illustrating their strategies and wanted to share, unlike Napoleon, the strategy of the chiefs with the people, down to the humble soldier. Moreover, they all posed the problem of the best strategy to be chosen, the criterion for which was the saving of human lives. Furthermore these books are full of doubly negated statements; that is, they argued with that non-classical logic which is necessary if a new method of solving a problem is to be found.[63]

We thus confirm what Gandhi often repeated, that non-violence is a science that is even older than Papin's invention of steam pressure power.[64]

Over the last few decades a radical change of this kind has begun in our way of reasoning deriving from a notion from the history of science. According to Kuhn, changes of paradigm do occur after all. The historical change that should take place today in national defence may be defined with the following phrase: "Peace as a change of paradigm".[65] The present paradigm is the arms' race and the achievement of the maximum destructive power. The anomaly is constituted by the threat of an Armageddon as the result of the application of this paradigm by two nuclear powers. Fortunately, a new model of conflict resolution is already known and was pointed out by great scientists (Einstein, Born), i.e. non-violence. Indeed, it suggests an empirical method for solving conflicts through "experiments with truth", as Gandhi put it; using a method that we have already seen in Freud, against the instinctual idea "He is my enemy", it sets its doubly negated sentence: "It is not true that he is my enemy". By putting it in different words, we have seen in the above that the very word "non-violence" implies a completely different logic.

This radical change in the cultural paradigm of collective defence was already recognised as a need by the highest political World institution. The last UN Gen. Secr., B.B. Ghali, instituted the Corps of civil Peacekeepers and civil Peace-builders which were to be considered on a par with military bodies.[66] The paradigm change began from that date on; in other words, a period of trans-armament– i.e. a period of democratic struggle between the two main models of defence - began, at least in principle, at the level of World politics. At present, we are preparing the beginnings of

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[63] These strategies are analysed in some papers edited in Italian; they are quoted and summarised in my paper: "The rational structure of the non-violent world view", in G. Gasser et al. (eds.): *Culture: Conflict – Analysis – Dialogue. 29 Wittgenstein Symposium*, vol. 14, ALWS, Kirchberg, 2006, 79-81.

[64] I offered a detailed justification of this dictum of Gandhi's in the paper: "Non-violence as a science of conflict resolution", *Anuvibha Reporter*, dec. 2000, **5,** 111-116.

[65] M. Nagler: "Paradigm as a paradigm shift", *Bull. Atomic Scientists*, **37**, Dic. 1981, 49-52.

[66] B.B. Ghali: *An Agenda for Peace*, UNO, New York, 1992.

trans-armament within each State.[67]

12. A new relationship between ethics and science

As a consequence, there is a new relationship between science and ethics. No longer is science an absolute value, to which ethics is subordinate. When a scientist constructs a scientific theory, at very start he makes two basic choices, respectively on the kind of infinity and the kind of organisation; owing to these choices found the theory, ethics comes first, science second. As a consequence, Tolstoy's question is answered; the traditional science claiming to come before ethics is dethroned, and science is subordinate to ethics.

In the following table I summarise the relationships between science and ethics according to both the past (i.e. Western) attitude and the non-killing attitude.

Tab. 3: *WESTERN AND NON-KILLING ATTITUDES TO BOTH SCIENCE AND CONFLICT*

	Western attitude	**Non-killing attitude**
SCIENCE	"One" science, i.e. *Unity* of science; unresolvable conflicts between scientific theories do not exist	Among scientific theories there exist conflicts which are unresolvable; pluralism even in science
ETHICS	There exist human conflicts which are unresolvable unless the opponent is destroyed	It is impossible for a human conflict not to be resolvable, owing to the *Unity* of mankind

Let us remark that the dominant Western view of science requires the belief in its Unity. This belief never will be verified, since it refers to all times to come; it is an absolute belief. In comparison, the belief in the Unity of mankind, which should be applied to conflict resolution, is more suited to the life of humanity; in short, it is a more valid value for mankind.

The same conclusion is reached when we compare the costs of the two beliefs. With the former the citizen is required simply to delegate to scientific experts, allowing them bring about the scientific destruction of an indeterminate number of human beings, while with the latter, the citizen, doubting the absolute value of mankind's intellectual constructions, involves his/her personal life in finding the best solutions to collective conflicts.

[67] Juridical statements similar to the main sentences of *Agenda for Peace* have been approved by the Italian Parliament: Laws 230/1998 and 64/2001.