

**A new nature that  
comes from  
Science and Society**

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*Educació i Cultura*  
(2014-2015), 25  
29-44



# A new nature that comes from Science and Society

## Una nova naturalesa que ve de la ciència i la societat

**Fernando Sancén i Anita Gramigna**

### **Abstract**

The changes that our society is going through nowadays, brought about by its dynamic relationship with science and technology, requires a new philosophy, a new ethic, a new symbolic universe, in order to understand this dynamism and above all to intervene in the direction in which science is leading society. This paper offers a new view of science and ethics based on the Philosophy of Organism. Based on this philosophy, ethics necessarily focuses on the rational subject; action constitutes its being and its environment. This article emphasises the powerful influence of science and technology in forming our current society, and the need to direct its development. The importance of nanoscience and nanotechnologies are mentioned as an important factor in determining the current changes in our society, and we postulate the urgent intervention of society in order to direct them based on a philosophical reflection.

**Keywords:** ethics, technoscience, education, relationship.

### **Resum**

Els canvis que avui viu la nostra societat, generats a partir de la seva relació dinàmica amb la ciència i la tecnologia, requereixen una nova filosofia, una nova ètica, un nou univers simbòlic, per comprendre el dinamisme i sobretot per intervenir en la direcció en què la ciència condueix la societat. Aquest treball ofereix una nova visió de la ciència i l'ètica basada en la filosofia de l'organisme. Basant-se en aquesta filosofia, l'ètica se centra necessàriament entorn del subjecte racional, l'acció el constitueix a ell mateix i al seu entorn. Aquest article emfatitza la poderosa influència de la ciència i la tecnologia per conformar la nostra actual societat, i la necessitat de dirigir el seu desenvolupament. Esmentam la importància de les nanociències i les nanotecnologies com un factor important que determina els canvis actuals en la nostra societat, i postulam la urgent intervenció de la societat per dirigir-les a partir d'una reflexió filosòfica.

**Paraules clau:** ètica, tecnociència, educació, relació.

*Aquest article fou aprovat per publicar-lo el desembre de 2014.*

## Introduction

Never before has human society been as conscious as it is today of its changing life. Besides the serious problems suffered for centuries, like inequality, hunger, discrimination, poverty, wars, and unemployment, it faces today the risk arising from technology. Today, the existence of humanity is already different than before; it has brought back to consciousness the fragility of its existence on the planet, not only because of a possible atomic catastrophe worldwide, but also due to progressive environmental degradation. This complex situation worsens when we consider the rush of those changes.

We are living now in a world constructed by technology, not only because humanity has constructed one second nature (Edelman, 2006) but because, besides the transformation of the world, man is becoming another 'itself', insofar as he improves his power to use nature as a domesticated one, and also because now he wants to transform himself, looking for a permanent improvement of his own existence. In fact, man seeks a better life not only through external goods (automobiles, entertainment, etc.), nor even through the improvement of his image (plastic surgery), but now seeks to give himself and his descendants a new way of existence that he decides for himself, and the actual technology makes it possible. The results of science and technology in our world and in our society perform new organizations for work, new politics, and all that has changed our society, introducing new ways of life, new values, new customs. We can say that they have formed a new *ethos*, abandoning, maybe with nostalgia, the past times. S&T have also changed man's vision; he thinks and acts differently than in the past. Actually, the power acquired by man, derived of the knowledge he has of the world, and growing faster and radically, gives rise to a new world and a new human being. But assuming that social change is continuous, some questions come necessarily: what will be the new reality of man and of his surroundings? Who decides it? The inertia indicates that the oppressive structure now effective worldwide will determine the answers to these questions. That is to say, there are a few powerful men all over the world who, moved by their own interests, will impose direction onto the new worldwide society generated by the power that grants them science and technology. Even if society laboriously looks for the solution to the problems resulting from S&T, the social structure where they are produced will not change if the cognitive structure will not. In fact, it is almost impossible to provide a solution to those problems if the structure causing them is continuous and unchanging.

The relationship between knowledge about nature and the power brought about by this knowledge leads to the relationship between science and ethics. Philosophy must bring this situation to social consciousness and construct a new symbolic universe, a new conceptual structure capable of explaining and correctly measuring up the actual conditions of humanity and suggesting the direction that humanity's change should take. In fact, it is necessary to explain and orientate the transforming power that science and technology have nowadays and will have in the future.

This paper aims towards deep thought about ethics from the relationship between science and society, taking into account that the main subject of ethics is the human act, and that this act is determined by knowledge about the world: that is to say, by science (Morin, 2001). This relationship shows a great dynamism, besides any absolute knowing, and human knowledge constitutes the axis joining them. Action, indeed, is grounded in knowledge, although it is fair to indicate that knowledge is also a form of acting (Piaget, 1970). We discuss the role and challenges of ethics, starting from the dynamical relationship between

science and society, assuming that such a relationship is the starting point of new forms of existence and acting to the individuals.

## **Society and Science**

The power man has acquired over nature through science is paradoxically originated in his own nature. Thanks to his rational nature, man has been able to create a second nature, bringing into reality new potentialities and new forms of existence of the world, and precisely of nature. This has been explained by Spinoza's expression emphasizing the contrast between *natura naturans*, and *natura naturata*: man has naturalized nature, impressing on it his rationality as a seal. Being the owner of his own actions, so long as man acts, he determines, and at the same time he gives form to his own physical, living and social surroundings. Only man gives meaning to the world and, in doing so, he seeks, collaborating with other individuals, his own good through the conformation of a world, seeking in that way his own satisfaction (Berger, 1967). But these changes conform also in man himself a new nature, new possibilities to understand and to explain the world. Man is able to explain the way these changes come into the theoretical construction (science) of the world. In fact, the human action has modified the *nomos* of our societies throughout human history and, as a consequence, has also modified their interpretative schemes, their moral principles, expressions of the traditional wisdom: that is to say, their *Weltanschauung*. This situation is also dynamical due to changes coming, and is also creative because a new reality comes into existence, a new nature comes into nature itself (*natura naturata*), and also into man's nature insofar as he knows the world and acts on it.

The knowledge a human being has about the world, and his action on it, drives us to ethics. We propose an ethics grounded in the permanent construction of our world thanks to the knowledge of nature, but also thanks to the construction of a new world based on that knowledge. This position encounters other thoughts about ethics we must consider. We are specifically talking about the Kantian consideration of ethics. Therefore, we examine briefly the philosophical meaning attached to Kant's thought, expressed by Herbert Marcuse and Jürgen Habermas. We start off the original critique Hegel addressed to Kant about the abstraction of historicity to construct the categorical imperative by the subject itself (Habermas, 1991). In fact, neither Marcuse nor Habermas take into account the changing historical existence of man to construct their moral norms. In fact, these authors separate science and ethics, even at an ontological level, denying the way their intimate relationship modifies a society's world view: that is to say, their *nomos* or *Weltanschauung*. Marcuse (1966), for instance, establishes an existential separation between science (the true) and ethics (the good); he maintains that besides the form science has to define the objectivity of nature and its parts, this scientific knowledge cannot be conceived as «final cause»: that is to say, as the origin of practical reason. He thinks that the ontological league between *logos* and *éros* (science and ethics or values) is broken, and maintains that scientific rationality appears essentially like morally neutral. Therefore, since values are separated from objective reality, they are subjective; they are not real. Consequently, ethics is separated from science on an ontological level.

In this way, the relationship between science and values, between scientific objectivity and subjective values, appears an abysmal divorce between science and ethics. Marcuse,

despite such duality (science–truth and ethics–good), accepts the rationality of science and recognizes that scientific knowledge, for its objectivity, is more and more dependent on the individual and proposes to start from an organic metaphysics, where the subject can be the origin and aim of the scientific objectivity. He talks, in fact, about the presence of a *constituent* subject, but only in the field of science, aside from morality. Nevertheless, he contends that despite the form as science defining the objectivity of nature and its parts, they cannot be conceived as “final causes”: that is to say, as the origin of practical reason.

Habermas, for his own part, agrees with the existence of pragmatic backgrounds, but he doesn't accept that science could be part of them, discarding all possibility of *éthos*' intervention in building moral principles. For him, the field of history belongs to practice, and it cannot take part in moral constitution because it doesn't belong to the field of justice; it belongs to that of science (Habermas, 1991). Specifically, talking about modern science, he maintains that science and philosophy have been forced to abandon the idea of a knowledge grounded in metaphysical principles, and therefore, since the moral is based on universality, he is forced to resign the presence of science, and consequently of *éthos*, in the constitution of moral universalism; that is to say, he must radically separate science from ethics. Nevertheless, it is to be recognized that in Habermas' writings lies the idea of the subject and of his transcendental value to establish, in an intersubjective communication, the best moral argument, obtaining in that way the moral universalism he postulates.

Indeed, Habermas perceives as much as Marcuse the determining importance of the subject in science –of this worthy universe they attribute to it –and in ethics. It would seem that they are opening spaces to ethics tied up with science, insofar as they criticize science from a moral position. They argue, in fact, that technology derived from science has been used as a «form of social control and domination». They insist, nevertheless, paradoxically, that such domination and control are originated in scientific rationality, which they consider *neutral*: that is to say, besides morality. For them, theoretical reason, which is pure and neutral, becomes subject to practical reason, resulting in a domination of technology over society, represented now in practical reason, whose domination is perpetuated and generalized not only through technology but *like* technology. Consequently, we can see that as much as Marcuse and Habermas first put forward the neutrality of science, they later maintain that its application is a mechanism of oppression in our society. They consider that theoretical reason obeys only the laws of rationality besides the phenomenical or changing world, explaining as a reverse situation man's oppression through science and technology. They maintain that values and culture obtain the legitimacy, although subjective, of technology, but this does not justify its objectivity, and it therefore remains outside of ethics. These positions about science and ethics expressed by these authors are contradictory; they first try to demonstrate the neutrality of science, and then they denounce man's oppression caused by science, which they interpret as the submission of theoretical reason to practical reason.

On the other hand, the problem of society's oppression originated in science, since it has to do with the material and social world, will be better approached starting with an epistemological analysis that necessarily should be completed by an ontological explanation of knowledge itself. Firstly, it is necessary to accept that human knowledge is not constructed to search the metaphysical principles of theoretical reason, but has a primary material and pragmatic aim; that is to say, it is orientated to the existence of the knower itself. In this work, we cannot prove how science is a logical construction starting from sensations accompanied

always by imagination, by previous knowledge, or by prior experiences, etc.<sup>1</sup> Nevertheless, we take as the foundation of our work such an explanation of knowledge. Human knowledge is a theoretical activity, a process, and constitutes the source and foundation of human acting, attributed by Kantians to practical reason. Taking into account its material and biological grounds, the explanation of human knowledge determines the sense of scientific and common knowledge, and can therefore also give reason to the world vision conformed by man, who adds a sense to each of his actions (ethics). We should insist that in studying the problem of human knowledge we must conduct a cognitive activity that is unique; we must, therefore, distinguish it and bring it theoretical foundations. In that way, the constructivist explanation of knowledge deeply completed by the actual neurosciences gives the fundamental concepts to ground the non-neutrality of science and its entailment with the *éthos* of human society and with its biological dimension (Changeux, 2002).

Piaget (1970) explains knowledge as a unique activity that constructs theoretic explanations to be validated by sensible data; and the formation of science, even if it is a theoretical construction, is originated in physical perception and also in theoretic explanations previously formed that constitute a cognitive structure, always present in the act of knowing and permanently changing as a result of knowing itself. Therefore, perceptions and cognitive structures always come together to determine the act of knowing. Human knowledge, and one of its results, science, has to be seen more as a creative construction and transformation (Edelman, 2006) than as abstraction through which the knower obtains universal notions. The outcome of such a construction is the cognitive structure that is related with physical perception: that is to say, with the object of our knowledge. We call these results symbols insofar as they are the result of sensation and cognitive structure present and acting in the knower in the same act of knowing. Science, for its own part, builds up a symbolic universe that has been validated by experiments. In this way, scientists confirm their hypotheses and obtain the certainty that the single phenomenon will act in accordance with scientific propositions validated previously in the experiments. In what concerns society, science acts in two directions of human acting: it deeply affects knowledge about the world, and also affects its relationship with nature when the knower obtains through scientific knowledge the goods required for human existence. Besides all that, it must be said that modern science has radically changed the concept of truth; nowadays, the inductive procedures to explain and to manipulate nature are considered as normal (truth), even if science is not absolutely truth. Now, if science permanently transforms the world, the man, his thoughts, and societies, it must be said that, as far as science is a process of knowledge about the world, reciprocally that scientific knowledge is influenced by previous knowledge accumulated in society. In this way, we can say that changes in scientific knowledge are influenced by society, which has problems to resolve and has an accumulated knowledge that serves as the origin of the scientific investigation. But the dynamical and reciprocal processes of modifying science and society must be explained by new theoretical and epistemological theories. Now we see that the fact of a science permanently tied with society, and the interaction between them, drives us to a new vision about ethics firmly related with this dynamism and with changes in

<sup>1</sup> The elements of a new development about human knowledge can be seen, among others, in the writings of philosophers and scientists such as Alfred North Whitehead, *Science and the Modern World* (1945); Jean Piaget, *psychologie et épistémologie* (1970); J. E. McGuire & Barbara Tuchanska, *Science Unfettered: A Philosophical Study in Sociohistorical Ontology* (2001); Philip Kitcher, *Science, Truth, and Democracy* (2001); Gerald Edelman & Giulio Tononi, *A universe of consciousness: How matter becomes imagination* (2000).

the operating structure of society. In fact, we can see a changing *éthos* in each society due to changes coming from science and technology.

Taking into account the power science and technology give to transform the world and man himself, a power that extends itself limitlessly throughout space and time, it is reasonable to leave aside the moral and theoretical neutrality of science towards the society that separates the supposedly disinterested search of objectivity in the name of so-called double reason. Indeed, it turns out more coherent to see all knowledge constructed from a historical situation of the knower –scientific knowledge is not an exception– because the human being cannot accede to an absolute and definitively stable truth about the world, nor about moral norms. Therefore, the scientific and technological activities belonging to history are fully charged of suppositions not compatible with the moral neutrality demanded of scientific and technological knowledge. On the contrary, there is a permanent interaction between human thought or knowledge and human acting; in such a way it is necessary to approach the problem of the relationship between science (knowledge) and ethics (action) starting from the subject's perspective because he acts based on his own knowledge. It must be added to the dynamism of knowledge that the individual is at the origin of scientific and technological knowledge. Therefore, the rational subject is at the centre of the dynamical relation between science and society. In fact, towards him science and technology go on, and through his acting he is at the origin of the world and of himself. But the rational subject also needs society for his existence and is at once the cause of his society. The fact of dynamical change in societies throughout human history taking its ground from human knowledge about the world and in his consequent action, demands, besides the epistemological explanation, an ontological one, leaving aside the matter-spirit dualism, even if such a dualism has been the central paradigm in philosophy for several centuries. That implies a recognition that the change in knowledge about world introduces changes also into society through human action, and also implies taking into account that science itself has pragmatically pushed away the concept of absolute truth. All that points to overcoming the common dualism in occidental thought that sees two realities: one which exists (material) and another which is thought, belonging to the spiritual soul. The ontological explanation of reality we now propose will take as its fundamental argument the unique and permanent physical interrelation in which runs the existence of the subject who acts and knows, being part of an interacting universal reality. Moreover, an epistemology that explains human knowledge as a result of the physical and theoretical interaction of the knower with his surroundings demands a further explanation about the dynamism of reality. Taking into account the subject's central role in that relationship, we point out at once his responsibility derived from his cognitive and transforming action that transcends himself and extends to his own society and to nature in its entirety. All that necessarily drives us to ethics; but before we speak about the relationship between ethics and science, we would like to speak about its ontological basis.

In fact, the introduction of ethics into the development of S&T demands the awareness and acceptance of the explanatory principles of society's transformation in the present and in the future that is already being constructed. But at the same time must be known the transforming power of science itself, of human knowledge or world view and of *éthos*: that is to say, of society itself. All that we have said until now leads us to outline the main terms of an ontology explaining the dynamism of S&T, as we have insisted.

## **Dynamism in our Society**

Until now, we have said that the individual is at the centre of the epistemology; his knowledge about the world and his actions upon it come through S&T. Therefore, S&T set up the core of ethics and ontology. A naturalistic ethics turning on a knowledge of norms, when abandoning the characteristic dynamism of human knowledge, turns out as absolute and contrary to man itself. In the same way, an ethics grounded on justice and good as absolutely valid principles loses the historic processuality that is characteristic of the human being. Now we must see that in our actual society S&T can be tied to an ontological explanation allowing us to recognize them as an important fact, or *datum*, in the universal process of becoming. In such a way, their epistemological and ethical characteristics would be plenty understood as part of human existence.

In contrast to the Kantian ethics, S&T must be taken into account in conforming an ethics turned to the actual situation of humanity, and also turned to the future that is being constructed by all individuals living today in our societies. Taking into account the dynamism of human existence, the social ethics must confront not only today's challenges of humanity, but also it is forced to reflect on the future of man and nature that are being changed by science and technology. There we see one of the great changes that necessarily must be taken into account nowadays by the social and philosophical disciplines. These changes originated in human acting in S&T must be explained by the universal principles by which is also explained the individual action. Since the human action ties man himself not only with other individuals in a society, but also with the material and living world, those principles must necessarily be viewed as strongly related, from the concreteness of individual acting, to the universality of being. Hans Jonas (1977) says that the last answer of ontology could be the basis of man's duty, and maintains that reflecting on duty should come back again to reflecting about being. This spiral that passes throughout the constitution of human being (ontology) and its action (ethics) faithfully reflects the dynamism in society caused by S&T and shows its entailment with individual action (ethics) and with the existence of being itself.

An ethics originated in the dynamism of human action determined by S&T coming until the universality of being must be grounded in such an ontology that takes this dynamism into account. Indeed, in order to construct a dynamic ethics that approaches the dynamics of actual science, it is necessary to establish how reality is a universe conforming itself permanently by the physical interaction of everything that exists. Quite briefly, we propose an ontological explanation of being itself that is a brief résumé of the Cosmology developed by Alfred North Whitehead (1979): the actual world is a permanent and uninterrupted process of physical presence by which all entities existing in the Universe are constituted and permanently changing. In that sense, the world must be seen as a process of permanent becoming of everything that exists; thus, the being of an entity permanently constitutes itself by his becoming into existence as a creative synthesis of the interaction it has with its surroundings. The way each entity becomes is by its physical relationship with its surroundings: each entity exists so long as it *prehends* or perceives other things in its surroundings; all being, consequently, exists by the *prehensions* it has of other entities; these *prehensions*, in fact, are sensible data coming from physical perception, and each entity integrates them selectively in its own becoming (Whitehead, 1979). The result of interaction and *prehensions* is the existence, the becoming, of each entity that exists. Whitehead insists that from this point of view, it follows that the concept of 'subject' applied to each entity

loses its connotation of substratum (*subjectum*) to which we are accustomed via Aristotelian thought; otherwise, now, so far as each subject is the result of the interaction it has and *prehends* from its surroundings, etymologically the subject would be seen as a super-ject (*super-jectum*). In other words, each entity comes to existence from the interacting universe in which and by which it is constituted as a creative synthesis. As a result of all this, we are now facing a new vision of reality: a universe in which creativity constitutes the fundamental characteristic of each being, a reality in permanent process, a dynamism inherent to the existence of all entities (Sancén, 2003).

In this theoretical context, we can see that the world expresses the dynamism by which all beings exist and manifest their permanent interaction as their own form of existence. Consequently, based on this ontology, whose main characteristics are creative dynamism and its universality, the suggestion of a new ethics makes sense as a historical ethics grounded in the changes of *éthos*. These changes, as has been said, bring out a new society, a new *éthos* which can be seen throughout the history of humanity. These traits of an ontology, considering the reality as a process, establish S&T as a datum or fact conforming all individuals and societies. At the same time, these traits express the dynamism and creativity explaining society itself. From this point of view, by his acting, the individual maintains an existential and constituent relationship not only with his fellow being, but also with his social, biological and physical surroundings, where he reaches his transforming action. In what concerns the ethical dimension of science, the individual holds the centre. Actually, he is the rational subject who decides the viability and financing of research projects and the development of emergent technologies, such as nanotechnologies; he is the subject who achieves these projects; it is he who produces the goods derived from him and who brings them to the market, and it is also he who incorporates them into his daily routine; all that is turned to the future not only of each individual, but of the whole of the Universe. Therefore, everything that is present in human action constitutes the object of ethics; and science, as knowledge about the world, is the main element of such actions. In this way, science and technology necessarily occupy a predominant position in the construction of an ethics concerned with the future of our societies.

Based on this historical view, and on the changes that are nowadays being continuously introduced by S&T into our society, it is necessary to think about an historical ethics, as historic as man and science; an ethics that includes as its own field the human being and his social, biological and physical surroundings, to which the individual is existentially tied. To sum up, it is necessary to think about a dynamic ethics in accordance with the process in which man exists. This ontological explanation brings us to think about an ethics whose central point is, as we have said, the acting man and all that comes together with his action: that is to say, the *éthos*, the past and the future of the rational subject and that of his environment.

## Science and Social Norms

Explaining reality as a process provides the theoretical elements that are necessary to, firstly, understand the relevance of the relationship between science and society, and secondly, to approach the analysis of individual actions as part of a community forged with norms it has constructed.

We have emphasized the permanent change that society suffers in its structure, in its world vision, and in its expectations towards the future, and we have pointed out that all this is caused by the scientific and technological activities associated with the introduction of devices to benefit the lives of individuals. We maintain the idea now that the dynamic change of science and society is an aspect of the permanent process of becoming in the universe. The characteristic trait of such a process of change in society comes from human action originated in knowledge about reality, and also in the good that man tries to reach when he acts. We have also highlighted that both knowledge and intention are present in each human action and that they are involved in a symbolism expressing the individual interpretation of the world and in the social structure which is maintained and reproduced by human action. Therefore, science necessarily points us to such an ethics whose characteristics come from its epistemological postulates and its practical applications. An ethics looking to establish a direction towards S&T, accepting their dynamism and change, must also be a dynamic one. That is why we propose an ethics centred on the subject as acting, testing the change in himself and conscious of the transformation of his environment. In this way, such an ethics will consider the future as a normative criterion, because the permanent process of change is also a creative process from inside society that comes from innovative S&T causes within it. But at the core of this creativity expressed by the interaction of an acting subject with all entities, as its origin and its result, is the rational subject: man himself. Therefore, the ethics we propose will be seeking each individual as constructing his own future and that of his environment. Moreover, the outlining of the properties of a new ethics that come from an ontology seeking the reality as process puts us in the way of social responsibility regarding science and technology. More than grounding what must be done seeking only past moral rules, a dynamical ethics will be occupied in thinking about what to do in the future, mainly in respect of science and technology, characterized by the dynamism we see in introducing permanent changes in the theoretical explanations, and in the applications they realize from the world's knowledge that they construct. This dynamical ethics, grounded in the process of becoming, takes into account the requirements of universality, obligatoriness (good) and historicity to which all ethics must respond.

The universality of a dynamical ethics comes from the ontological explanation declaring that all that exists is process, pure becoming, and where the fundamental category is creativity through physical interaction. This universality brings two fundamental axes to ethics: on the one hand, the subject's action – that is to say, the universal form in which exists all entities; on the other hand, the constituent relation that links together the acting subject with all entities. In that way, human acting is equivalent of being, and at the same time it is existentially related with the Universe. The obligatoriness comes from the good determined by the subject in action, but such good implies not only the particular subject but also its surroundings, because from this one arises (proceeds) the good is obtained by each subject. The historicity of ethics comes from its epistemological dimension. In fact, knowing involves the knower's past acting as datum in the knowledge itself. Further, this knowledge will be, in its turn, a datum for successive knowing activities.

These characteristic traits of ethics, we propose, express its creative dynamism. Such a dynamic vision of ethics contrasts with the Western philosophical tradition, with our culture, and with the current world view. Nevertheless, a glance at the dynamism we postulate for ethics based on the ontology developed in the Philosophy of Organism and on philosophy developed in Ancient Greece demonstrates that the main ideas of dynamism in

reality and of ontological process were present not only in the Presocratic philosophers but also in the classics, whose ideas are at the origin of Western civilization. For instance, Plato, when talking about the teaching of virtue, asks himself: how can we teach virtue if we do not own the knowledge of the Absolute Good? When a guide leads us to the top of a mountain we can trust him because, as the guide he is, he knows the summit and therefore the way to reach it. But we, how can we say that we teach virtue –that is, the way to achieve good– if we do not own the idea of good? (Menon, 89 BC). The idea of good is strange to the man who never reaches it; he must continuously search for it in a physical reality that is synonymous of change. Therefore, man cannot act in accordance with Absolute Good. That is the tragedy of Platonism. Aristotle, in his Nicomaquean Ethics, maintains that being is synonymous with activity, and that entities exist and are visible only through life and perception: «We exist so long as we act, that is to say, insofar as we live and we act» (1168<sup>a</sup>); «Being means to us to perceive or to think» (1170<sup>a</sup>). Aristotle speaks clearly about a process because perception means physical interaction insofar as life means interaction with other entities. We can see that even if the ethics we propose is more directly tied to the results of modern science, it is not dissimilar to a dynamic vision of reality that can be glimpsed in the Platonic and Aristotelian philosophy. In fact, they also take into account, specifically Aristotle, the science of their epoch.

Current S&T, for reasons we have outlined, drive us to construct a new ethics; an ethics arising from the main role they play in our society in permanently configuring the changing *ethos* in all societies; an ethics appointed to the necessary surpassing of the discourse that proposes a scientific orientation first to investigate obtaining results, and only after that, to take care of the ethical and political implications. With George Khushf (2006), among other natural and social scientists, we consider that it is necessary to form a new culture of scientific research and of the commercial development of technology, where ethical thinking will be integrated permanently in that research, in politics and in the institutions dedicated to education, science and culture. In this way, we have left out such ethics whose main interest is to construct absolute norms, predominantly concerning the duty of the human being to submit his actions to those norms. With an ethics centred on the subject, the moral responsibility does not depend on the observation, per se, of norms, but it resides in the total development of a human being's existence and that of his surroundings, as he looks to the future.

Viewing an ethics engaged with the congruence of human action vis-à-vis norms, looking for a correct formation of universal norms and the application of such norms to guide concrete human action, and also seeing that science and technology does not take into account the justice and goodness specifically related to members of our societies, even if in reality they are tied with social circumstances that bring together all human beings, S&T should adopt a new form of acting in such a way that they will approach the problem of good and justice, taking into account their force in conforming man and society.

In that way, we can see some ethical concepts, such as Norm, Good, Responsibility, Creativity, Future, etc., and try to understand how good and justice can be sought in concrete human acting.

The new ethics sees the norm as an expression of the physical and cultural conditions of society. This expression –the norm– has a sense because it tends to benefit the existence of each human being who belongs to that society: insofar as the norm expresses the idea of good in and for each society, it gains compulsoriness for its members. Therefore, the norm

expresses the conditions in which each rational subject can reach his own good, and seeking it, he favours necessarily the good of other individuals in society. The individual is at the origin of norms and their last objective is the rational subject who, insofar as he acts, searches for his own good. This one consists, as has already been indicated, of remaining in existence; that is to say, into permanence of being. Therefore, the norms must be seen as an historical construction that can change if the circumstances determining the social and individual good suffer some modifications.

The idea of human good is present in all physical interaction and it comes into being by the idea each man has about himself, and by the election of what he wants to obtain with his action. Since the idea of individual good for each subject is determined by himself, and since when obtaining his own good by acting his existence becomes as a new being, it can be said that each subject (super-ject) is the cause of itself (*causa sui*). In other words, each man, thanks to his own action, is the origin of himself. Therefore, the final cause, in the context of a dynamic ethics, acquires a different meaning; that is to say, it will be seen no longer as justification of the practical reason. In fact, one's own good constitutes the motor of any human action, and consists, in the first and last instance, of conserving itself as existing. This is not an exclusive property of man; in fact, so long as any physical or biological entity, such as an atom or a cell, *prehends* other entities of its environment, it secures its own good. That is to say, it can remain in existence as a result of its physical interaction. This idea of good, nevertheless, is only attainable through the existence –the good– of «the other»; that is to say, the good for each entity, including man himself, is only possible through interaction with other entities because on this depends the good of acting's subject; out of the other's existence non-existence is possible. It is useful to add that man's action requires the perception and explanation of the world that results from his own past. The final cause of his action is the human being itself, but it must be said that the good he looks for exists only in his environment, and that we postulate a fusion of human being and nature in terms of final cause.

Therefore, the moral responsibility does not limit itself to well-being or happiness of a rational subject, because the human action reaches necessarily not only his immediate environment but also other entities which are distant in space and time, as we can see through the history. Indeed, since man can only exist in interaction with his surroundings, the responsibility derived from his action necessarily reaches «the other», who is not anything else but his own environment, the world. Taking into account that throughout S&T the human being reaches his own good, it must be said that knowledge about the world expressed pragmatically by S&T is today the most important issue for Philosophy and Ethics, and a determinant concern of responsibility to each subject in our society: scientists, technicians, academics, politicians, investors, consumers, legislators, industrialists, etc. In fact, the rational subject's responsibility for his action necessarily reaches S&T so long as they are a determinant element in obtaining his own good and that of his surroundings. Therefore, the direction and dimension of S&T should constitute a central commitment for today's society, specifically for ethics and philosophy, starting from sociology.

We have seen that human acting is simultaneously the result and the cause as much of man himself as of his surroundings. Indeed, action is always performed coming from a pre-existent situation previously determined by the individual, and at the same time by society (social habits, values, customs, etc.). In such a situation, the decision of acting comes from the idea of good and any action always creates a new occasion, a new entity, insofar as something

new comes from this action; it also becomes a modification in the environment insofar as this one is the container of the subject's action. Consequently, it is possible to conceive an ethics as a dynamic discipline referring to creativity in the universe. This ethical creativity takes shape in the development of each subject and of his society. We are now putting forward an ethics occupied of values actually recognized, but also an ethics permanently analyzing the usefulness of values and norms in order to draw into any society the good that individuals seek through their acting; an ethics seeking new forms of the subject's existence. These points configure, in fact, an ethics orientated towards the creative search for new relationships of subjects with their environment in which they find their own good. The main objective of ethics is the future of man and his society, both tied existentially with the bio-physiological world in which they obtain their own good.

Consequently, a dynamic ethics will have some particular characteristics distinguishing itself from traditional ethics: the human action is the main concern of ethics, because all activity is a permanent interaction with the physical, living and social surroundings, and because human action is grounded firstly in the individual and collective past (own experience, culture), and secondly in his future, taking the form of desire and tendency towards his own good. Besides, these elements or data of human activity (past and future) conform to each individual as a moral entity, and in this way man as actor is the main object of ethics reflection. Indeed, our actual science, far from being neutral, constitutes the more powerful element of an individual's action and of *éthos* in our societies.

## The Future of Science and Society

Because human acting is the point of confluence of man with his social, physical and living surroundings, and because it is the expression of man's thought, including his past and his aspirations, we can see that ethics and culture in any society are tied; indeed, it would be said that ethics is the expression of a culture to which ethics provides the elements of duty and universality. Such a universality comes from the reach (all that exist) of its norms, and their obligatory nature is a force acting through orientation that circumscribes the individual acting in his own existence and that of society.

Today the transforming power of science and technology is part of our culture (Gramigna, 2012). Their powerful influence on society is concentrated nowadays in the so-called emergent technologies, especially in nanosciences and nanotechnologies. Actually, nanotechnologies comprise almost all investigation and development of scientific and technical activities around the world and obtain great amounts of resources. The main significance of emergent technologies for our society comes from the fact that each innovation there achieved will bring changes in our lives. This is especially true of nanosciences and nanotechnologies, because they work with matter at a level where the compounds we know are constructed, where the cells of living organisms interchange information, and where molecules form themselves.

The results of nanotechnologies are therefore new materials, much more resistant and at the same time lighter, that will change all the artefacts and devices we use in our daily lives; they are developing new drugs exactly directed only at the affected cells; new weaves for the human body; new, more precise equipment for medical diagnosis; new textiles, new materials with new electromagnetic properties able to store in a few nanometres enormous

amounts of data, etc. All this is now considered a new revolution that will bring new forms of life, a new world, new ways to act in it, new materials, new ways of industrial production, new goods, etc. All this will necessarily form a new subject and a new world view, a new society with new values, new customs, new forms of existence. This is our modern reality that demands of philosophy, particularly ethics, a reflection that, although based on the present and the past, is turned specifically to the future where each individual and all of society will be living.

It is necessary to go deeper in the ethical reflection based on this changing reality that expresses the creative capacity of man and society, specifically today with the nanosciences and nanotechnologies (Sancen e Gramigna, 2011). A reflection aiming to change the theoretical and material structure now determines the results of S&T to profit from it.

The ethics, which we have only outlined, turns around the creativity that becomes actual in the action of each subject. The abstract reflection remains a method for the development of ideas. The concrete and unique reality is the only place where everything we have indicated would be real. Therefore, ethics, although a philosophical discipline that requires abstraction for its development, is grounded in concrete reality. It is at the level of each individual's action that the ethics becomes reality, there that the values and norms become present, and where the ethics is diluted, opening the way to the conformation of each individual and of his surroundings. The proposal of a creative ethics turned to the future can only be real in the thought and the action of each subject.

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