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An epistemological and ethical analysis of new *bio*technologies.

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But the serpent said to the woman, "You will not surely die.
For God knows that when you eat of it your eyes will be opened,
and you will be like God,
knowing good and evil."

Génesis, 3,4-5

"0.000000000004 seconds after the Big Bang*, an amount of energy similar to the full output of 64 billion years of sun energy was building up. What was there before that?*
A vacuum state. But in quantum mechanics theory, there is energy in the vacuum.
Then, does matter come from the vacuum... that is, from the void?"[2]

Rocky Kolb

No technology is value-neutral, and neither is the underlying philosophy on which it is founded. Technology is always the result of a context where a specific system of values is upheld. Those values may be broadly diverse: merely cognitive, or ethical, aesthetic, political, economic, and religious, to name just a few critical ones.

This is so because every philosophical conception entails a particular array of values, and also, it usually either supports or challenges a value system. Thus, according to the values it entails, supports or challenges, every *philosophy* will foster the pursuit of certain ends or ideals of conduct...

When questions such as: what constitutes the structure and content of science?; is/are there any method(s) which characterize(s) scientific knowledge?; what is/are the goal(s) of science?; is science rational? get replies that stem from a "standard" conception of scientific knowledge, we should not be naïve so as to equate those answers –resulting, essentially, from a value-based archetype- with the truth.

The nature of the epistemological debate cannot be understood unless it is viewed as an expression of deep ideological interests at the root of society and culture.

The academic and social image of science and technology has undergone profound changes throughout the last centuries. The classical view of science as true knowledge, free from values, collapsed with Kuhn's thesis, heralding a tradition that deviated not only from

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[2] Torrent Rodrigo, Francisco Javier. *El Legado Hermético de la Antigüedad.* Bubok Ed., Argentina, 2008. página 331, nota 3. Nuestra traducción.

positivistic philosophy but also from *Mertonian* sociology, focused on analysing the scientific community[3].

Philosophical and cultural criticism have given way to the current proposals to assess technologies constructively, focusing on the need to devise political strategies allow ing democratic control of innovation, and on social learning that consents to discuss the assumptions underlying every alternative, so that technologies will reflect conscientious decisions in line with widely shared social and environmental values.

Classical philosophies of science (both *verificationist* and *falsacionist* approaches) became stagnant and greatly deteriorated already at the beginning of the 1950's, to a great extent, as a result of their being unable to apply their rigid formal apparatus to large areas of actual scientific disciplines. An ideal science had been formulated in the image and likeness of the noblest logical-formal wishes of their creators, but that was all they were: wishes.

In the 60's, authors such as Kuhn, Feyerabend, Toulmin or Hanson[4], introduced, in line with history, a new approach, which focused more one the dynamics of science and on the context of discovery. It was now necessary to give up any attempt to confine "that thing called science" to the patterns of logical analysis, and turn, instead, to historical and even evolutionary issues. Also, regarding the advancement of knowledge as lineal and cumulative had become outdated, as well as the divide between pure science, applied science or technology –the former being exempt from moral reproach, while the latter was likely to fall prey to such judgement depending on whether its applications were positive or negative.

The *Philosophy of technology* arose later, probably because there has always been a certain bias in culture, resulting in an epistemological discredit of technology vis-à-vis the supremacy of theory.

To some authors, the technological turn in the philosophy of science (i.e. acknowledging that prior technical procedures frame theories themselves) has contributed not only to give up the classical divide between science and technology but also to pave the way to interdisciplinary studies on technosciences. The new sociology of technology acknowledges the role of both human agents and government agencies as well as corporations in the development of science and innovation.

The *constructivist* tradition of technology has been criticized by sectors advocating more pragmatic traditions concerned with the consequences of technological development, which have accused it of almost complete disregard for the social consequences of opting for technology. Likewise, the conception of relevant social actors and groups has been criticized,

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[3] Robert K. Merton is considered the father of the sociology of science. The peak of his influence (along with his disciples and collegues from Columbia University) spans until the '70s. The *Mertonian* program revolves around science viewed as a social institution, and does not address its epistemological core. In his classical 1942's paper, Merton presents his view of the scientific community as a social group whose distinct features comprise a set unwritten rules (referred to as scientific *ethos*). The *Mertoniana* school developed several studies about the historical expression of this *ethos* and its potential anomalies (scientific fraud, demise of meritocratic universalism due to certain individuals' or groups' initial advantageous position, etc.).

[4] Hanson, quoting Gestalt psychology, pointed out the "theoretical load of facts", that is, every piece of data gathered bears the ballast of the experimenter's previous context. Depending on their cultural environment and (often concealed) pre-conceptions, observers will highlight certain data and relate them differently from the way they would in some other context. Philosophy has discussed this concept as the *infradetermination* of observational data by our previous theories.

since it is not clear who claims or decides what groups or interests are relevant. There is concern about "the voiceless", who would suffer the impact of technological change. It has been claimed it is important to account for the decision arrived at and the way they are reached, as well as the "hidden agenda" behind such decisions –which is never disclosed. The point would be to unveil deeper social interests and processes that may be at the root of social choices of technology. Finally, there is also criticism against the seeming contempt for everything resembling an evaluative stance –whether morally or politically based— that could be used to assess the possibilities offered by technology in terms of humankind's wellbeing and development.

Science and technology have become political and economic strategic resources both for States and for industry. Still, while citizens are aware of the advantages techno-scientific development may contribute to their wellbeing, there is also a strong awareness that technological change is at the root of many environmental and social problems.

A number of countries have searched for a way to solve this conundrum by means of an approach that keeps the promotion of innovation separate from control and regulatory matters. Still, their goal of providing early warnings and future impact perspectives has just helped, in any case, to correct some disruptions once technology was already implanted. Additionally, their "technocratic rhetoric" has been charged with favoring political and economic interests. As a result, newly introduced technologies have been legitimized only *a posteriori*, making it impossible to have a say on their configuration and application.

In the eyes of many, this evaluative paradigm has therefore reached an end, and we should shift to approaches that consider the dynamics of technology in society and among citizens, bearing in mind that technology's impact does not depend just on technical factors but also on the way its effects are perceived by various social actors. Likewise, the "black box" of the economistic approach needs to be opened, unveiling the value judgements underlying the factual pre-eminence of the search for higher yields or technical excellence.

One of the keys to explain the exhaustion of the traditional risk assessment model is verifying that such assessment is also a social construct, contingent upon persuasion, negotiation and struggle among various actors –which obviously differs sharply from the classical view of objective rationality.

The model's inefficacy, along with mounting social pressure demanding greater involvement by citizens in technology-related decisions, has encouraged new *constructivist* models as more fitting ways not only to assess and manage risk but also in an attempt to govern technological change. This approach completely gives up any pretense of an objective, neutral assessment related exclusively to experts' opinions, and focuses more on social and cultural choices linked to certain technologies, as well as on the socialization of decision-making processes. We cannot keep on casting advocate and controlling roles inflexibly. The key lies in learning to manage this responsibility by engaging in a dialog with the community.

In a social learning framework, the new evaluative paradigm is reflexive. It pays attention to what technology reflects and it replicates, through values, existing cultural patterns and social relations. Unlike the technocratic assumption that public perception of risks is often irrational, this stance claims such perceptions encompass symbols, values and insight which are crucial to contextualize technologies and integrate them in society. Thus, the public sphere would bring forward (under scrutiny) implied commitments ranging from virtual hypotheses on how to organize society to harsh social prescriptions aimed at adjusting society

to technology. This also means that "experts" should be spurred by social critic and controversy to look into not only the socio-political scenario where technologies are implanted but also the core of their own prior frameworks and foundational social models.

This constructive stimulus requires an institutional framework which acknowledges the need to address this issues in a systematic, explicit way, and admits that for technology assessment to be operational it should be necessarily politicized, raising the touchy issue of whether existing representative democracies are ready to allow this kind of participative management.

Ensuing theoretical and practical problems may in fact seem overwhelming.

Right from its early days, modern science has fostered freedom to divulge ideas, theories and the outcome of studies in order to allow criticisms and share knowledge. Let us not delude ourselves into ignoring that, to a greater or lesser extent, there has always been a relationship between the State and the market as well. Yet, as a source of power (science is power), it is nowadays when science is forced to give in, more often than before, to political and economic imperatives.

Restrictions imposed by commercial secrets clash against the Mertonian norm of *scientific communalism*, ideally considered a distinctive value of science. Most academic scientists whose research is funded by corporations or governments need to request authorization to publish their work. Although they are usually allowed to do so, the very fact that they need an express consent, external to science, shows these scientists can no longer adhere to old communalist ways freely. These limitations, typical of the *R&D* model, have spread to all scientific research because many industrial laboratories conduct –or have universities do so- not only applied research but also basic and strategic or basic directed research.

The market value of the results yielded by research has become the greatest concern in scientific and technological policy.

In today's world, scientific research is faced more and more with the requirement to be of technological interest as well as technology-compatible. For better or worse, in the XXI Century a *D&R* paradigm has emerged –in that order– that is replacing the *R&D* one. Thus, patents are seen as a measure of *R&D* results once they have been turned into inventions. Data on the technology balance of payments aim at measuring a given country's knowledge and technological services purchase and sale transactions (which is viewed as an indicator of technological dependency, depending on the direction the balance tilts). Finally, measure indicators of commercial transactions by state-of-the-art technology industries may be used as estimates of the impact of scientific activities on industries and the economy.

However, is it possible to appraise basic research social and ethical quality considering its economic and social returns? Governments and corporations think so. Therefore, it is one of the basic factors in a country's scientific and technological policy when allocating resources to *R&D* projects, supporting certain research lines and rejecting others. Governments, corporations, the military, and numerous pressure groups all influence the science and technology that is carried out in a country. Contextual values –utilitarianism, economic gains, national prestige, political and military power– are all subject to the practice of other values that have always been considered primordial or inherent in academic science and in society, which demands, or gets people's demands for, vital involvement in the configuration of the technological or techno-scientific model.

There is also pressure exerted by spiritual means. It stems from the feeling that there is an external –effective- moral power, we are dependent on. That powerful *externity* even forces us to act against natural inclinations. This powerful influence is perceived by individuals, but its source is transfigured by them. The religious phenomenon entails a division of the universe: the sacred and the profane; and of these two, the pre-eminence of sacred principles is both reinforced and protected. Durkheim's[5] thesis on the origin and nature of religious experience already stated that it made the social experience intelligible, in which individuals represent themselves and the society they belong in as well as their relationships with it. The divide between the sacred and the profane distinguishes objects and practices symbolic of the principles on which a society is organized, embodying the power of their collective strength and of each of its members –as long as they continue to belong-, which, in turn, binds them to comply with social constraints.

This dual conception of the universe –characteristic of religious life, following Durkheim- pervades science, which keeps a respectful distance because its attributes are seen as transcending mere believes, prejudice, habit, error, and confusion. The principles guiding both realms –the religious and the scientific one- are similar. They both belong to the social sphere, and they both elicit similar reactions and treatment. They both expect to be spared analysis and regulation by mere mortals, and both of them claim a privileged status, as well as sacrifices fit for cults! Science, like religion, is basically a source of strength, and it will hardly submit to or even consider abiding by an external, "secular", social ethics –i.e. being sacred, science needs to be kept above any regulation; in any case, it is self-regulated.

Just like modern quantum physics and astrophysics, molecular biology refers to a world of processes which are difficult to determine; a world where understanding processes calls for letting in heuristics and randomness, uncertainty, conceptual complexity, that is, *relationality* among concepts meant to allow us to understand a non-compartmented reality –one which is unreductible to simple, clear, distinct elements. The same applies to social reality,; incomprehensible from simplifying, deterministic frameworks.

If those who carry out and appraise, plan and execute, create and receive knowledge –in Edgar Morin's words- are *homo sapiens/demens* (those who lack absolute certainty about what they think of the consequences of their actions), they also need to rely on anthropology of knowledge and the *anthropologization* of knowledge. We cannot think in terms of gods and demons when it comes to setting a path or an array of paths in complex, dynamic systems, far from being balanced. Thus, in an attempt to subsume them all, a principle arises: the principle of ethical and political *uncertainty*[6] and of the need to "ecologize thoughts and action".

The outcomes of actions are, ultimately, unpredictable; intention –being aware of their difference and non-correlation with outcomes– constitutes the one element from which man may infer the transcendence of the outcome, the theological composite sought after.

Complexity does not contribute to uncertainty but unveils it; it reveals it, and makes men aware of the mental banality underlying the *trivialization* of society and nature. Society's logic stops being the logic of the functionalist system to become the logic of the system-organization. It is not from the top where the positions of the subject are determined. That is

[5] Durkheim, E. *Las formas elementales de la vida religiosa*. Akal, Madrid. 1978.

[6] Uncertainty can be argued to exist at all levels of the real: the physical, the biological, and the social and historical levels. We could therefore refer to a general principle of uncertainty. Obviously, uncertainty is different at each level. To be sure, an atom does not pose ethical issues.

one of the roots of the ethical-social conflict vis-à-vis the realities of new biotechnologies. In their relationships individuals are creators. They stop merely carrying out tasks to become, literally, the ones who create society when, as citizens, they take part in making new ground rules and new conventions.

Breakthroughs in biotechnologies pose social conflict, which calls for the creation of new rules and new deals, in a society viewed as process –a recursive process. (A process on whose outcomes hinge its own continuity.) Fully understanding how biotechnologies work is impossible since they constitute a system, or several systems, in a state of constant flux and transformative self-organization, whose horizons are always sliding away.

Reductionism to a single observation level turns out to be lethal in contexts where it is not just scientific issues, but also social, and cultural ones that should be considered. Overcoming the type of reductionism to specialization carried out by modern policy decision-makers and managers (the experts), in order to implement a policy takes into account –in a conscientious way- culture's creative potential. A policy of mankind, thoroughly onto-anthropological.

The new paradigm shifts the relationship between the parts and the whole. The properties of the parts can only be understood by considering the dynamics of the whole. What is referred to as a part is just a configuration on an invisible network of relationships[7].

Unlike the old Cartesian paradigm –which held the view that any complex system could be understood by considering the properties of its parts-, the new paradigm argues that epistemology –i.e. the process of knowing- should be included in the description of natural phenomena. Currently there is no agreement on what type of epistemology is the right one. Science could never offer a comprehensive, definitive understanding of reality. Every concept, theory, and discovery is limited and inaccurate. Only including all the variables –even those still ignored– may provide us a factual vision, and changes in any of them are apt to altering whatever may be perceived as "truth". Reaching Descartes' much sought-after "certainty" as "the deepest passion of the Western mind" exacts accepting that once –and if– attained, that "truth" will be fragile, narrow, almost individual.

Every philosophical approach to morality entails, *ipso facto*, moral judgements, and moral reasoning among the individuals it addresses. Thus, it cannot afford to be *edifying.* Given the nature of its content, explicitly cultivating moral judgement implies clashing against numerous concepts (justice, freedom, duty, happiness, etc.), and it therefore requires a philosophical approach that will often be challenged by such concepts and their developments, which will block, or obstruct, appropriate moral judgement through prejudice. It will then be necessary to analyze those concepts, not so much to establish moral reasoning but rather to «unblock» it. (At this point moral philosophy assumes the role of cathartic of moral reasoning.) In any case, philosophical knowledge does not rely on different sources from the ones mundane or scientific knowledge do, nor should we expect from «Philosophy» ground-breaking *discoveries* about morality.

Since ethics is a "second-order discourse" (critical analysis) of "first-order discourses" (existing moralities) and specific practices related to such discourses, it shares something with epistemology (also a "second-order discourse", but on technical-scientific discourses and practices): a call for rationality. Still, while epistemology refers mainly to theoretical reason, ethics refers mainly to practical reason. Summing up, both theoretical and practical reason

[7] Capra, Fritjof. *Pertenecer al universo*. Ed. Planeta. 1998.

may be crucial tools of bioethics, since the former would allow us to assess the cognitive and logical quality of moral reasoning (i.e. their "consistency"), and the latter would allow us to assess the "moral" quality of actions legitimized by such reasoning, by weighing their actual or probable consequences (action morality), and/or their agent's character (agent morality).

As an instrument of applied ethics, bioethics should therefore consider both types of reasoning in its work, which makes this field one marked by interpretative and pragmatic conflicts.

When faced with an interest dispute with a moral background, bioethics uses rational analysis and practical knowledge tools to assess which of the solutions suggested may be considered the most reasonable one, once its consequences have been weighed. To sum up, bioethics main tools are rationality and reasonableness –theoretical intelligence capable of enlightening arguments supporting an action, and practical intelligence capable of making the action feasible and acceptable (i.e. "reasonable").

Nevertheless, since it is also a practical reason activity that does not depend on logical needs, bioethics will sometimes resort to intuition, allowing it to identify counter-intuitive conclusions –i.e. non-immediately *cogent* ones- in order to subject them to further investigation and weighing. In other words, moral intuition's role is to "regulate" theoretical reason in terms of limiting rationalist excesses. However, as a rule, moral intuition plays its role at the inception of moral reasoning, in the pre-critical stage of moral analysis.

Another tool to be used and required by practical rationality is good *examples*. This is so because examples refer, in a general way, to actual events and situations, allowing for argumentative economy.

Strictly related to the previous tool is the use of *analogies*. Although they are not examples of phenomena that actually take place, analogies facilitate conducting field research on arguments, since they may shed light on the issue being debated by:

1. allowing to regroup already judged cases –at least similar, if not identical–, which may result in a substantial economy of means.

2. allowing to create or design situations capable of clearing up a case. This is a frequently used method in particularly complex situations, and it is referred to as "mental experiment" (*Gedankenexperiment*).

3. finally, *analogy* may also serve a critical function, showing, for example, that an argument is wrong. Thus, using *analogies* should also by screened by critical racional analysis, which will have to set the boundaries of the *analogy* and the specificity of the case under scrutiny.

Another practical tool, widely used in novel situations, is the *slippery slope argument*, mainly concerned with possible negative consequences and potential abuse resulting from an action. Even though the intentions behind this kind of reasoning may be good, since it is motivated by caution and therefore aims at warning about "what may happen" in certain situations, it is almost always used in a negative way, as a pretext to prove that what may happen almost certainly "will happen". However, it does not prove anything, except fear in the face of novel situations.

Finally, we should remember a more pragmatic tool, represented by the *search for compromise*, whose aim is reaching, in every conflict situation, a peaceful and –as far as possible– diplomatic solution. Still, this tool should also be, eventually, submitted to critical

assessment, since it entails the danger of losing the rationality of arguing, and, above all, the danger of accepting an amoral –if not cynical– position.

Discussing the methods of bioethics and, *mutatis mutandis,* of any other form of applied ethics, entails referring to the nature of ethics and its instruments, which are used in an attempt to resolve conflicts of interests and values. It entails, especially, having a) clarity about descriptive approaches, and understanding conflicts; b) a deductive and inductive approach to reasoning aiming at legitimizing a decision; c) a pragmatic approach to the relation among the means, the ends, and the agents involved, intended to weigh the effects of the decision. Therefore, this thesis is at once rationalist and pragmatic. It is about putting forward possible "paths", i.e. *methods* likely to settle moral conflicts –which is the closest we can get to attaining the communicative ideal of a community.

Implementing bioethics methods implies considering rationality's dual nature: its theoretical nature (descriptive and discerning) and its practical nature (applied). It also entails considering the sociocultural context of the conflicts of interests and values where bioethics must function, using its tools in order to find a reasonable, fair solution which will therefore be acceptable to all agents involved in specific situations. Still, it is necessary for everyone involved to belong, *by law and in fact,* to their respective communicational universe, and for their interests to be considered impartially by everyone –with the only valid instruments being argumentative reflexion and the weighing of consequences resulting from the options chosen.

This is the field where bioethics works, and where ethical questions arise, such as: *How can we know* if an action is fair or unfair, good or evil?, *How can one decide*, as a person, a citizen, a member of a profession or specific community, what the legitimate goals of my action are, and what values and principles are worth defending? In other words: *How can we prove* to other people that such answers are fair or wrong?

These three types of questions point to the interdisciplinarity of the bioethics field, marked by its ties to "knowledge" (*cognitive* question), "decision-making" (*pragmatic* question) and "proving" (*communicational* question), where what we decide to do is well organized, correct, and acceptable to others.

Additionally, considering the method entails the subject of the basis and its definition, which calls for a tautological justification: *the basis legitimizes the path we mean to use, which, in turn, is the only means ensuring the operational relevancy of the foundation*. In that sense, the method would be, in fact, what gives practice certainty, even in the absence of a factual basis.

The method also has a supplementary goal, particularly relevant here, since it comes out as a moral of the right thought, bearing in mind that what I mean is: how are we to act so that what is considered "true", "certain", "useful" and "good" may be acceptable to any reasonable person?[8].

Summning up, in bioethics methods aim at "trustworthy" thought and "correct" action.

[8] This was succinctly put by Jean Piaget when claiming that *"Logic is the morality of thought just as morality is the logic of action"*. *Le jugement moral chez l'enfant,* 1932.

Following Mainetti, in a Pygmalionic sense, technology is the art of sculpting, or moulding, human nature[9]. The myth actually exalts an artistic *ethos* –man's nonconformity to nature and his eagerness to transcend it- and the divine power to beget life, the art of *biogenetics*. To him, rather than Prometheus or Faust, it is Pygmalion who stands for the meaning of the scientific quest, the philosophers' stone, the secret of all human research, the dream driving them: knowledge of the body; the science of that power, the art of reproducing and repairing life, creating new bodies following one's imagination and will. The problem is, then, knowing to what extent intervention in human nature is possible and permissible; when introducing a new technology –let's say, a biotechnology- constitutes genuine progress from a qualitative viewpoint; if so-called revolution means liberating or manipulating individuals and society, and if it serves human dignity or conspires towards dehumanization.

Faced with technology's inherent ambivalence or nature's dialectics, and the artifice reminding us of Pygmalion's story, bioethics –Mainetti warns us- needs to surmount a twofold obstacle, the *Scylla* of technological optimism and the *Charybdis* of technological pessimism:

- the temptation of equating morality with the logic of technology, good with fulfilment of desire, duty with the power to do, what is morally required with what is technically viable.

- the temptation of equating morality with the antilogic of technology, good with living up desire, and duty with being powerless to do, what is morally permissible with what is naturally possible.

On principle, it is wise to avoid both extreme stances: the technolatric and the technoclastic one, both an "offensive" ethics and a "defensive" ethics that will prejudicially limit morals to the role of accelerating or curbing –rather than leading- technological development. That is what seems to be happening among the two major moral families fighting over the bioethics field: advocates of "the natural order of things", who condemn most innovations, especially when it comes to the area of sexuality and procreation; and the champions of usefulness and freedom, who see outcomes and the possibilities of scientific knowledge as the true genius o our species[10].

The biological revolution pays attention to the idea –in itself revolutionary for philosophical antropology- there is no such thing as a human nature. That, however, under no circumstance does it mean, like Big brother says in Orwell's 1984, that *"human nature is our creation".*

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[9] To Mainetti, while in Prometheus artifice is defined through the "artifact" (the orthopaedic, or compensatory, device of culture), and in Triptolemus, through the "contraption" (the secret to submit nature to human ends), in Pygmalion, it manifests "artistry", the creation of the only un-natural thing *sensu stricto* in the world. Mainetti, José Alberto**, *Bioética fundamental. La crisis bio-ética***. La Plata, Quirón, 1990.

[10] All these reasons reveal the profound anxiety the *biofiction* of future mankind brings about in today's man, in view of the ambiguity of the *biohistorical* utopia. "Extending life, choosing a child's sex, posthumous fertilization, fatherless procreation, sex transformation, extracorporeal gestation, modifying organic traits before or after birth, chemically regulating mood and character, genius or virtue, made-to-order… All this is seen from now on as a due feat or as possible feat of tomorrow's science" (Our translation.). Jean Rostand's text renders, in subtle irony, the dual face of the biological revolution; all its might and fragility, its ambivalent sense of deliverance and manipulation, humanization and dehumanization.

The Pygmalionic, or anthropoplastic, *ethos* stands for this ambivalence. On the one hand, it is an expression of anthropologism, viewing man as the measure of all things and will to overpower cosmic nature. On the other hand, it represents naturalism, suggesting the cosmos as a universal order where man finds a sense of self as well as meaning. Such duality displays the cultural revolution put forth by biology today, the contrast embodied in genetic technique and an ethics of gens for a humankind that conflates test-tube babies and sexed dolls. Bioethics will have to offer a balanced, evolved answer to the anthropocosmic confrontation brought about by the biological revolution underway.

Natural barriers have always been a prod to man, and that tradition should not be substituted with new (exotic) ethical dams resulting from moral and legal basis. Following this argument, we may conclude that, assuming, for example, that technical safety issues are resolved, and provided there is no evidence that a cloned child will suffer from physical or psychological damage, cloning may be supported. In a way, it is acknowledged that presumed or possible ethical and social concerns would not be soundly justified so as to warrant the State's meddling in the area of reproductive freedom and privacy[11].

Insisting too much on the damage caused to *ideas* about family and society may mask, in some cases, a sheer conservative strategy functional to *certain* ideas, historically biased, about *one type* of family and society, at the service of certain group or class interests. However, communities based on a plurality of ideas and values cannot expect to have certain ideals of good always backed up by legal systems.

Furthermore, in other relevant area, environmental sciences will undoubtedly provide suitable technologies to substitute for the natural resources we exploit, as well as to reduce and recycle polluting waste. Biogenetics might also contribute to the solution through an array of new life forms. However, only ecological knowledge may challenge the survival crisis by means of a radical attitude change towards nature.

Environmental degradation is not a problem that calls just for technical-scientific solutions. It is not in fact so much a problem in the objective sense of being something external to man, but rather a problem involving human awareness, attitudes, and behavior. The ecological crisis arises in the aftermath of the formulation of a new ethical system. A bridge between scientific events and moral values, *bioethics* mediates between the survival imperative and solidarious responsibility in order to preserve earth biosphere. Ethics question is, therefore, how should we live?; reconciling the survival imperative and that of human dignity –a reconciliation that is actually the essence of *anthropodicy*[12].

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[11] Discrepancies from other proposals (mostly from Europe), which focus on "social and ethical offenses", reflecting the complexity of symbolic and cultural dimensions contributing to the common good, cannot be hastily overlooked. European legal instruments themselves include, in some way or another, several compensatory mechanisms to offset citizens' autonomy, based on other classical bioethics principles, such as non-maleficence and justice. In this regard, the political community's interest and need to shape, somehow, family structure has always been acknowledged.

[12] CL K. 0. Apel "The problem of a macroethics of responsibility to the future in the crisis of technological civilization: an attempt to come to terms with H. Jonas 'Principle of responsibility"'. *Man and World* 20:3-40 (1987) Jonas criticizes the utopian idea of progress according to the "principle of hope" by Marxist Ernest Bloch. Apel reformulates Jonas maintaining the idea of progress and utopia not just as an imperative of survival but also of human dignity. To him, it is not a question of prioritizing survival over dignity or the other way around.

The ethics of usefulness and consumption is being questioned as an *ecocidal* lifestyle, since it leads to the anarchic proliferation of artificial, destabilizing ecosystems. Environmental ethics dusts off old virtues such as frugality (productive and reproductive), and writes down a new table of values revealed by nature.

The concept of quantitative progress –material growth, productive expansion, increase in comfort and in world population, etc.– is being fundamentally challenged. A different paradigm is being offered as an alternative to the development paradigm, one that improves quality of life globally –technical development aimed at qualitative growth, at creating and preserving the best human conditions. For humankind, facing the task of planning their own growth according to their natural life conditions, bioethics represents a tool to prevent the ecological issue from being resolved, right away, through technocratic politics or a universal eco-dictatorship. Thus, we need to impart education in a new, civilian ethics or cultural morality, rooted in nature as an axiological project. In this project bioethics allows for taking into account non-instrumental values and non-pragmatic or utilitarian attitudes, to design the new model in such a way that a compensatory theory of nature "offsets" the compensatory theory of culture. This means proposing an environmental ethics, beyond the current level of utilitarian arguments, for the conservation of natural resources and areas.