The access to the achievements of science as bioethical topic

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Abstract

In many forums has been claimed the need of establishing as a central topic in the agenda of the underdeveloped countries the equitable distribution of the benefits of science. Nowadays, the world is enjoying a remarkable process about science and technology progress. Nevertheless, benefits yielded from it concentrate in the North. The inequity in the distribution of benefits increases the gap between developed and underdeveloped countries, which ultimately causes greater dependence. This, besides being a political problem has also deep consequences for bioethics, which justifies UNESCO's Universal Declaration on Bioethics of 2005 referring to it repeatedly. The mercantile approach and privatization of knowledge strongly conspire against economic and human development in the South, infringing the standard of living of its people.

Key words: Knowledge. Technology. Research ethics. Moral obligations.

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The purpose sought in this work is to show the access and the free circulation of knowledge as topics for bioethical agenda, highlighting the obstacles currently presented for the less developed countries. We took as starting point for this analysis the changes occurred since the Enlightenment. Since then, science got into a course of significant development based in freedom of research and the free circulation of knowledge. During a long period, science and society lived in peace and harmony, and science was central to human progress.

Bunge, quoting Robert Merton, founder of modern sociology of science, pointed the existence of a rigorous moral code, which – among other *institutional imperatives* – recognized: the *communism or the collective property of knowledge contrasting with private preponderance of technical inventions; the lack of interest and impersonality of* *researchers* [1]. One researched in order to know more, to unravel nature's mysteries, to give society gotten fruits with the purpose of facilitating progress and the wellbeing of human kind. There was in this scheme a certain consensus in the scientific community, seldom unknown. Whoever broke an ethical norm in this field would expose himself to peers' repudiation.

This was in summary the picture that reigned in science world until half of last century. The existence of world-armed conflict of huge magnitude then led protagonists from one and other side to formulation of research plans that entailed efforts of unknown features. The mass destruction weapons - including the atomic ones – the rockets, the sophisticated communication systems etc., could not be designed in laboratory – either public or private – but would require scientific and technical conjunction originating in several fields of knowledge and the investment of huge amounts of funds.

Collaboration of a critical mass of scientists, availability of relevant sums of money, the existence of an organizational and management scheme appropriated to required end was necessary for this. It was not anymore of a research designed by a scientist, but a research that should meet the requirements imposed by circumstances, which had motivated it. It was, then, that the first linear cut in research existing since enlightenment took place, a cut that gave place to the emergence of *big science*, which brought major changes in science organization and management.

Echeverria notes that in face of the instrumental rationality model – where the ends of scientific activity were clear and distinguishable – the goals and objective of the macro-scientific activity constitute a complex structure does not waive internal and external tensions and interests, since that activity is moved by a plurality of actors often with conflicting interests and objectives[2]. The subject of macro-science changed into plural, breaking the traditional methodological individualism.

The macro-science characterizes itself for concentrating resources within a limited number of research centers, by the specialization of labor forces in laboratories, by the interaction between engineers and military, for the development of relevant projects from the social and political standpoint [3]. This mutation led to plans and objectives to be achieved were not discussed only within scientific community – where consensus could be achieved – but that they should be compatible to the objectives of committed public agencies and substantially with fund providers.

A large project needs huge sums of capital, whose contributors are more interested in the economic return from the project itself than what it may mean for society. A mega scientific project not only pursues objectives related to growth of scientific knowledge, but it intends also to general advances and improvement of available technologies in such manner as to result useful and suited to economic and financial interests. Consideration for interests and expectation of fund investors led to a fundamental change that not only affected research but the committed scientists as well [4].

The birth of the techno sciences
According to Hottois, techno science is a neologism that subtracts the operational and technical nature of contemporary science, comprising basic research [5]. Its emergence sets up the second cut in the path undertaken by science since the enlightenment. Although it is not correct to mix macro-science with techno-science, the implication that the former had on the later are unarguable. This does not prevent that the distinction between basic research and applied research (that is, whose ends are discoveries and invents immediately exploitable from an economic standpoint) has disappeared. It means that it is not only a *pure, theoretical* scientific activity in one hand, and applied or technical sciences in the other. Basic or applied, research is techno-scientific always and everywhere technological apparatus is present and it has a great weight [6].

The arising of the techno-sciences during the 1970s consolidated the changes undertaken by macro-science and it contributed for decisive steps toward scientific knowledge appropriation.

In the historical outcome of science and technology, as autonomous categories, a phenomenon appeared in few years that would have deep consequences for the scientific policy, in elaboration of knowledge, in its privatization, and its conversion into transactional commodity.

We have, in the core of these changes, a growing overlapping of both categories with evident predominance of technology over science. This predominance is observed not only at the creation and dissemination level of knowledge but over the commitments assumed before society as well. The new outlook, because science is a practice characterized by its universalism and by its honest contribution to collectiveness without other interest than contributing to its growth and dissemination, presents singular features that in its set lead to a path increasingly diverted: *knowledge appropriation*. Core features of this new reality that the techno-sciences contribute to are, in Echeverria's opinion:

a. the techno-scientific culture has a strong business component;
b. knowledge, by converting into an economically appealing asset, stops circulating freely as it is caught by its creditors;
c. potential achievement of patents is an evaluation criterion for designing techno-scientific projects, as well as its innovation capacity, is decisive the transfer of outcomes to firms that operate in the market;

d. techno-sciences are guided always by economic values;

e. in majority of cases, *patentability* primes over *publicity* [7].

These features suppose a more accentuated change in the relationships of science with society, that impact at universal level, contributing to increase the scientific-technological gap between the developed and developing worlds. Technology – as referred by Queraltó – has converted into a possibility condition of science itself and beyond, its most important *external* and committed condition [8].

Currently, scientist increasing needs technological contributions to keep on working in the search of truth. From the multiple examples that could be brought on this new reality, I want simply to refer to one: the Human Genome Project. Such endeavor could not arrive at a good port without a significant technological contribution. Incorporation of new computers with greater memory capacity, faster processing constituted a fundamental contribution to such a point that bioinformatics is a discipline from which researchers cannot disregard in molecular biology or genomics.

In parallel, basic science contribution are central to many technological advances. The distinction apparently clear between science and technology is set under questioning due to the growing intertwining between natural sciences and technique, which manifests both in technificiation of science and in the *certification of technique* [9].

Quintanilla points out in the same direction and rectifying what we have stated that relationships between science and technique are complex, highlighting two relevant notes: 1) the development of current technologies depends entirely in scientific knowledge; 2) the advance of knowledge is deeply conditioned by technological development. One of the consequences of science incorporation to the industrial system is, precisely, the limits between basic science, applied science, and technological development result increasingly more diffuse [10].

However, this reality cannot induce us to error. There are differences of method, ends, relationships with the world that we cannot leave out without pointing out and not going into generalization that ultimately has major ethical implications both for actors and for countries. What matters – stresses Echeverria – is to have criteria to distinguish the techno-science, science, and technology without implying a demarcation among them, since their respective thresholds are diffuse in some aspects [11].

From an axiological perspective – teaches Echeverria - with the arrival of techno-sciences, the values that are most characteristic to capitalism enter in the core of the techno-scientific activity. The fast enrichment, for example, that traditionally had be alien to the scientific community became part of of the objectives of the techno-scientific firms. Techno-science incorporated into its axiological nucleus, a good portion of the technical values (usefulness, efficiency, efficacy, functionality, applicability, etc.) and if still keeps epistemic value, the second subsystem of values (the techno-scientific) have a weight so considerable as the first (the scientific) [12].

It is probable to notice a diversity of ends between science and technique, in the light of current reality, what should point to a greater differentiation. The close relationship that it is established in the level of research specific activity counterweights the diversity of ends sought for, showing an *ethical differentiation,* which results neither possible nor convenient to underline. Facing the management of science, we have the management of techno-sciences that overlap themselves in the economics of innovation that respond to market requirement. The goal of profits for the techno-scientific investments leads to the promotion of commercial interests over those of ethics.

Science has installed itself inclusively institutionally in the industrial production enterprise and this made that it changed preferably the organization of research and, to a certain extent, the nature of scientific knowledge and the philosophical issues that sets out its development[13]. In this picture stands out as core feature of current reality *the hiding of information obtained* and its outcomes, which presupposes *private appropriation of knowledge*, central topic on which this works develops.

The private appropriation of knowledge and of its fruits

Knowledge conceived as one more commodity, paths toward its privatization and trading were open. The legal instrument that facilitated such change was the *invention patent*. Thus, slowly, we find knowledge, natural laws, basic science contribution that remained submitted to private domain.

Knowledge – although symbolically converted into commodity – does not stop from been an immaterial good, which, from a private law standpoint, would mean the impossibility of its *appropriation*, since appropriation is a concept referred to thing (material goods susceptible of having a value). The resource of appropriation, to which we name in this circumstance, to explain the step from public domain to the private, almost achieves the same effects with the application of principles that govern the intellectual copyrights.

The path through which appropriation of knowledge takes place is located in the core of patents rights. Although the patent holder is not legally the *owner* of the object that claims the patent, he acquires a set of rights in relation to it that actually converts him into a true owner for a certain period of time, since the exclusive rights granted by the patent excludes all other agents, during its validity, to enjoy the same.

In global terms – and in a globalizing approach of the intellectual property – patent holder enjoys an exclusive right that allows distancing any other individual from production, sale, trade, import-export of the object comprised in the claims of the patent. It is in this sense – and not in another – that we use the expression appropriation, as this exclusive right in practice does not provide major differences than the domain or ownership over a determined good. A core questioning arises hereto: *can be patentable a so immaterial good as it is the scientific knowledge?* Of course, not, in as much as patents protect inventions of products, that is objects or devices or in its case procedures, meaning paths to get a product.

To achieve patenting knowledge it is necessary a previous operation converting it magically into a *product* or into a *commodity*. In science and technique – Albornoz reminds us – the sole thought bases itself in the absolute hegemony of the innovation vision over any other dimension according to which scientific activity could be guided. It is not accidental that it occurs since this perspective implies, basically, in reducing scientific and technological knowledge to an economic asset [14].

Establishing the chemical structure of a gene and the correlative order of basic pair constitutes just a *basic science contribution*, a *discovery*, in as much as that it was not known before– logically set apart from the field of inventions – just a new reality created by the central countries national patent offices, makes that the mere human intervention in the sequencing process converts its outcome into an invent (appropriable in essence). Thus, currently it is considered as patentable invention the genes, its partial sequence, proteins, cell lines, single-nucleotide polymorphism (SNPs), the microorganisms exiting in nature, etc., even when human intervention has not produced any kind of structural or functional change.

This *service* that patent offices grants to firms turns basic science contribution to knowledge into an invention, as well as a microorganism found in nature, into a *novelty*. Nature is, thus, located in its set out of the *technique status* (legal fiction that uses patent law and that comprises the melting pot of knowledge existing at universal level in a given moment, which serves to characterize the novelty, primary and unavoidable requisite for any invention). Therefore, every scientific contribution is in principle patentable, which is *appropriable*.

The recent development of biotechnologies gives a clear example of what we stated. A major part of knowledge produced in this area may have technical application, but not directly or immediately. Now they are part of the world of science. There is, strategically, interest in economic actor to anticipate appearance of technology, attempting through it to patent biotechnological, and biomolecular processes combined with the DNA sequences that relate to them.

The possibility of been able to patent a knowledge about something that is natural or the several stages of a research process (*research tools* as Dal Paz y Borges Barboza designate them as *pre-industrial knowledge*) have deep consequences of scientific research itself [15]. If a researcher departs from this new reality knowing that he may get patents on simple scientific knowledge, not yet translated into technological contribution, his loyalty towards people who employs him (firm, university, public research institution, etc.) will lead him into hiding all kind of progress in his work, destroying a criterion primed since enlightenment: the free circulation and communication within the range of science, distorting, thus, his commitment to society.

Franceschi points, in this line, that intensification of relationships between public research and enterprise and the multiplication of research contracts implicit in it implies the generalization of secrecy imposed by enterprises, which finance the works. The extension of market principles forces public research laboratories to an strategy of retaining information, as well as the decrease of academic articles. The resource to a systematic protection of the findings of research necessarily implies a delay in setting it available to scientific community. Massive introduction of patents in the circuit of scientific knowledge production constitutes a brake in streamlining knowledge, and it favors behaviors of retaining information, inclusively on research false leads [16].

Pestre had warned about this already by pointing to how the rules of intellectual property changed and the opening of a new capability of action for some types of funds, made that the most abstract knowledge turns into a production factor financially visible and direct. For some –he states – this new organization has as consequence an exclusion of long term concerns, a reduction of heterodox and *free* researches, a focusing and a concentration on monetizing domains and, consequently, the oblivion of fields of study, complaining that *it should be maintained a balance between legitimate return of investment for the inventor and protection of the general interest, which advocates a fast dissemination of knowledge*, as Dias Varella points to by quoting Foray [17].

In this same line, Dominic Foray teaches that privatization based in patents jeopardizes other means of scientific production viewing that the principle consists in not disseminating the outcome before getting protection through patents. This results in the reverse of ends sought by science. What scientific research needs is the free flow of knowledge and not the abusive and illogical monopolies that retrench it [18].

I have brought up these opinions, stated from diverse points of view, to highlight that patenting policies do not work only over already granted patents, by setting barriers on the use of claimed objects. Rather, they work to downplay the criteria that should apply to the several stages of research to add secrecy, to avoid communication of findings produced in its course, and thus to violate one the core principles that had consecrated modern science: the free circulation of knowledge without obstacles and precaution of any kind. *The appropriation of knowledge goes along necessarily with its hiding and retention*. Just as highlighted by Frison Roche, the appropriation of knowledge is not that of an object built from knowledge, but rather from knowledge in itself pointing to other direction [19].

The threshold between discoveries, scientific theories and natural laws (not patentable) and invention (technical creations that are fruits of man's creative activity) fades out. This is not a topic that is discussed internally within the scope of law but has deep consequences in social order. In its turn, the French National Committee on Ethics pointed out that *distinction between invention and discovery does not constitute simply in a legal principle, but rather it responds to unarguable ethical principles* [20]. The basic differentiation between discovery, scientific theory, etc. – excluded *a priori* of patentability – and operational inventions (patentable) is justified, according to Ghidini mostly by the advocacy of the pure research mode.

It is fair to remember that science nourishes from exchanges, opinions, set in common knowledge, of verification *in community*, even if sometimes ih live counter position between researches of new hypothesis faced and the traditional way of non-proprietary production is also more efficient for the development of pure research. There is not an ideological axiom in this but rather the fruit of long reflection developed based on experiment, either of economists from the liberal school or of industrial property historians. If pure research brought from the scope of proprietary rationale of applied research, innovative potential would be reduced, as well as of the same freedom spaces, Rebeca Eisenberg warns [21].

Well, the distortions worked out through lax interpretation of industrial property laws to enable knowledge deprivation achieved unheard extremes that not only deserved critical opinions from experts in the field but that were condemned by members of the scientific community. Por In thier behalf, I refer to Robert Laughlin's acute reflection, 1988 Nobel Laureate in Physics: *el the reverse world of patents grew so much that one does not see the horizon. When a court decides that computers programs are not algorithms or that genetic sequencing are not nature's law, there is not much left to do to* *prevent wind, land or the act of thinking from patenting* [22].

Behind the subtle epistemological dialectics that heats up the debate – Hottois reflects – disguise major economic interests and the pretention of certain multinational enterprises to protect their discoveries-inventions as fast and promptly as possible, first fruit of the investment in research and development[23]. Every research that one intends to carry out based in knowledge trapped by the industrial property rights become more problematic as it will be necessary to count on the license from patent holder, which not only makes difficult the project to be undertaken but in parallel makes it more expensive when one must acknowledge intellectual property rights on licenses.

The differentiation of basic science contributions regarding technological achievements not only point to the existence found categories but it entails a core distinction between free circulation knowledge and the technological contribution (in principle, appropriable). Science - A. Kahn states – articulates and advances based on accrued knowledge, every new contribution in this field overlaps with those existing, contributing to form the common tree that nourishes all those who are imbued with the same creation and progress spirit. This constitutes in brief accounts the scientific heritage of which we are all beneficiaries and depositories. The free circulation of scientific knowledge constitutes one of the pillars on which lays the world science. If this circulation is attenuated or liquidated, the entire humanity will suffer its negative consequences [24].

In light of the new reality, techno-scientific outcomes are converted into commodities and instead of communicating freely in specialized magazine; they become private property since the initial phases of research [25].

Equity in sharing the benefits derived from scientific research

In the other hand, the final declaration of Unesco World Conference on Science held in Budapest in 1995 stressed that most of the benefits of science are unevenly distributed, as a result of structural asymmetries among countries, regions and social groups, and between the sexes. *As scientific knowledge has become a crucial factor in the production of wealth, so its distribution has become more inequitable. What distinguishes the poor - be it people or countries - from the rich is not only that they have fewer assets, but also that they are largely excluded from the creation and the benefits of scientific knowledge*.

The mentioned declaration notes that *sciences should convert into an asset shared by all people,* science is a powerful instrument able to understand natural and social phenomena, and it will have probably an even more important role in the future as the growing complexity on relationships existing between society and the environment are better known. In very emphatic terms, it aggregates that equality of access to sciences is not only a social and ethical requirement for human development but additionally it constitutes an need to exploit fully scientific communities potential all over the world, and to guide scientific progress in such manner that it meets the necessities of humanity.

The topic that we deal does not run out in the study of relationships between developed and developing countries, but it presents itself as one of the topics that arouses the interest of bioethics. After a long period in which bioethics seemed to be encompassed by topics generated with the advances of scientific research around biomedicine, a reaction toward giving it a more open content was produced, which in parallel points to the social conditionings of health.

There is a series of topics that usually were set apart from its realm of interest (public health, environment, food, quality of life, poverty, economic and social development of countries), which certainly have close relationship with people's life and health and should be part of bioethical reflection. In this region, voices were raised that tried to give it a more open content in order to characterizes it as multi, inter, and trans discipline [26].

Unesco Universal *Declaration on Bioethics and Human Rights*[27] was discussed and approved based in these ideas 2005 that. surpassing natural obstacles, receptioned many of mentioned topics. Directly related to the topic raising our attention, it was included in the benchmark of the objectives of Article 2f): "*promote equitable access to the advances of medicine, science and technology, as well as the broadest possible circulation and a fast shared use of knowledge related to these advances and their benefits, paying due attention to the needs of the developing countries*".

In consonance with this objective, Article 15 – located among the principles – under the title *Shared Use of benefits* establishes that the results of scientific research and its applications should be shared with society as a whole, and within the international community, particularly with the developing countries, stressing among the forms that it may assume the *access to scientific and technological knowledge*. Article 24.1 establishes, in its turn, that states should foster the dissemination of scientific research at international level, and to stimulate free circulation and shared use of the scientific and technological knowledge.

We can extract, from the afore mentioned, a few conclusion on the more central problems that are present in current international conjuncture and that relate directly or indirectly with bioethics. We shall consider them:

The stimulus to free circulation of the scientific and technological knowledge

Scientific knowledge, as Stieglitz features it, is a world public asset: a mathematics theorem is as valid in Russia as in the United States, in Africa as in Australia. Without any doubt, some types of knowledge have unique value mainly for those who live in a determined country, but scientific truth, from mathematics theorem to physics and chemistry laws, are universal [28]. From this, one can deduce that the stimulus to free circulation of knowledge does not constitute a mere expression of wishes, but that it presents as an requirement from less developed countries but from the international scientific community, since only in an ambiance that facilitates dissemination is possible for sciences to develop.

Policies that lead into hiding knowledge, although they may be profitable for certain countries and enterprises, lack the ethical basis since they not only deprive less developed countries of the achievements but in parallel they reduce the spaces for research, and, thus, cutting the advances of science.

Shared use of benefits resulting from scientific research and its applications

Research became centralized in the developed countries as techno-sciences consolidated. This option moved both the existence of a critical mass of researchers and the existence of expensive equipment. The human genome sequencing is an illustrative example of this new reality, a mega project in which public and private laboratories located in their majority in the developed countries participated.

As the project progressed, the sequenced genetic material was patented in the developed countries. In 2001, the Biotechnology Director of the United States Patent and Trademark Office (USPTO) admitted that over twenty thousand patents on genes or linked molecules were granted since 1980, and around twenty five thousand others pended a resolution. Cassier informs, in a later work, that requests increased from five thousand in 1980 to fifty thousand in 2001, and he warns on the accrual and overlapping of requests over the almost totality of human genome [29].

The less developed countries, been excluded from the research, not only lost the benefits that such intervention directly brought about, but their scientists lost the opportunity to share ideas and to increase their knowledge in order to serve the interests of their countries. In parallel, the document advises in sharing the fruits of application outcomes of knowledge yielded by research. EstosThese fruits may consist in using products or procedures derived from research, both during the trial stage and in its concrete use with human ends. Such benefits do not get to the developing countries without payment of royalties or licenses even when the majority of rights agreed in the central countries lack legal or ethical justification by allowing appropriation of natural information.

The promotion of access to the advances of medicine, science, and technology

The balanced access claimed hereto is blocked by the international patent system emerged from the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO). The appropriation mechanism of knowledge works both at horizontal and vertical levels.

At the horizontal level one observes the rupture of the basic divisor line between discoveries and basic science contribution in one hand, and patentable inventions on the other. With the divisor line erased, the objective requirements of patentability are interpreted very loosely enabling that *everything under the sun* may be object of greed and private appropriation. At the vertical level, in parallel, one notices a growing current targeted to expand the field of patentable inventions, from the natural laws, biotechnology, genomics, to software etc. [30].

The especial care toward developing countries

Both Unesco Declaration Articles 15 and 2of) have special mention of the developing countries as specific addressees of the proposal made. On this, the already mentioned *Declaration of Budapest* of 1995 indicated that scientific research and its applications may have considerable repercussions aimed at economic growth and sustainable human development comprising poverty alleviation, and the future of humanity will depend more than ever from the production, dissemination, and balanced use of knowledge.

This access of the developing countries to the advances of science and their fruits decisively influences in the wellbeing and health of large masses of people, which shows that once again we are entering in the field of bioethics. As long as countries – without distinction of any kind – prevent unrestricted access to scientific research fruits, as long as knowledge remains encapsulate in the power of a few to profit from its applications, as long as the achievements of science are hidden systematically, economic and social development of the third world will be a goal hard to reach. Meanwhile, the gap that sets apart developed world from the developing one will continue to widen up, submitting entire population to hunger and condemning them now to unacceptable life conditions.

WTO's TRIPS Agreement that constituted the framework, based on which rely, at international level, intellectual property rights, sets in its Article 7, among its objectives, that protection and compliance of intellectual property rights shall contribute to promoting technological innovation, technology transfer and dissemination in reciprocal benefits of technological knowledge producers and users in such manner as to foster social and economic wellbeing, and the balance of rights and obligations. This is reiterated in Article 66-2 in as much as it established that member developed countries offer incentives to firms and institutions within their territory targeted to foster and to provide transfer of technology to member developing countries, so these can set a sound and feasible technological base.

Final considerations

It is worth stressing, to finalize this article, that above explicit dispositions were not a gift of industrialized countries to developing countries, but that they recognize their case in the multiple concessions that they were pressed to admit. It is too much to indicate that such policies affect the developing countries, indefinitely postponing their populations of enjoying a better condition of living, and condemning them to an existence unworthy of the human species. Here is the reason in which equitable sharing of benefits derived from science is (and it should be) part of the bioethical agenda.

Resumen

El acceso a los logros de la ciencia como tema bioético

Desde diversos foros se viene reclamando como un tema central en la agenda de los países subdesarrollados el reparto equitativo de los beneficios de la ciencia. Hoy el mundo vive un proceso notable en lo que se refiere al avance de las ciencias y las tecnologías. No obstante, los beneficios que de ello derivan se concentran en el Norte. La inequidad en el reparto de los beneficios acrecienta la brecha que separa a los países desarrollados de los subdesarrollados, lo que en definitiva impone una mayor dependencia. Esto, a la par de ser un problema político tiene profundas implicancias bioéticas, lo que justifica que la Declaración Universal de la UNESCO de 2005 se refiera reiteradamente a él. La privatización y la mercantilización del conocimiento conspiran decididamente contra el desarrollo económico y humano del Sur, vulnerando el nivel de vida de sus pobladores.

Palabras clave: Conocimiento. Tecnología. Ética en investigación. Obligaciones morales.

Resumo

O acesso a os benefícios da ciência como tema bioético

De diversos foros se vem reclamando como tema central na agenda dos países subdesenvolvidos a repartição equitativa de benefícios da ciência. Hoje o mundo vive um processo notável no que se refere ao avanço das ciências e tecnologias. Não obstante, os benefícios que deles derivam se concentram no Norte. A iniquidade na repartição de benefícios aumenta o hiato que separa os países desenvolvidos dos subdesenvolvidos, o que, em definitivo, impõe maior dependência. Isto, além de ser um problema político, tem profundas implicações bioéticas, o que justifica que a *Declaração Universal sobre Bioética e Direitos Humanos* da Unesco, de 2005, se refira reiteradamente a ele. A privatização e a mercantilização do conhecimento conspiram decididamente contra o desenvolvimento econômico e humano do Sul, vulnerando o nível de vida de suas populações.

Palavras-chave: Conhecimento. Tecnologia. Ética em pesquisa. Obrigações morais

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