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# Time, science and consensus: the different times involving scientific research, political decision and public opinion

## Tempo, ciência e consenso: os diferentes tempos que envolvem a pesquisa científica, a decisão política e a opinião pública

## Tiempo, ciencia y consenso: los diversos tiempos que implican la investigación científica, la decisión política y la opinión pública

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**ABSTRACT**
This essay analyses the asymmetrical relationship between the time of scientific research and the time of the different segments interested in their results, focusing mainly on necessity to establish technical consensus about the fields of science that require rigorous investigations and texts. In the last years, civil society sectors – mainly scientific journalism, legislative power, and public opinion – has shown growing interest in participating of the decision making process that regulates science routes. In this study, we analyzed the decision making process of the Biosafety Law, as it allows research with embryonic stem cells in Brazil. The results allow us to conclude that this asymmetrical relationship between the different times (of science, scientific disclosure, public opinion, and public power) contribute to the maturing of the dialog on scientific policies, as well as to the establishment of a consensus concerning science routes, which aims at the democratization of scientific work.
**Key words:** Science. Knowledge. Public Opinion. Scientific Disclosure.

**RESUMO**
Este trabalho analisa a assimétrica relação entre o tempo da pesquisa científica e o tempo dos diferentes segmentos interessados em seus resultados, sobretudo com a crescente demanda de se construir consenso técnico sobre campos da ciência que exigem rigorosas investigações e exaustivos testes. Destacam-se, sobretudo nos últimos anos, as pressões de setores da sociedade civil, interessados em participar do processo decisório que orienta os rumos da ciência, entre eles o jornalismo científico, o poder legislativo e a opinião pública. Como exemplo, foi analisado o processo decisório do projeto de Lei de Biossegurança, que permite pesquisas com células-tronco

embrionárias no Brasil. Os resultados permitem concluir que essa relação assimétrica entre os diferentes tempos (da ciência, da divulgação científica, da opinião pública e do poder público) contribui para o amadurecimento do diálogo sobre política científica e a construção de consenso sobre os rumos da ciência, com vistas a democratizar o fazer científico.
**Palavras-chave:** Ciência; Conhecimento; Opinião Pública; Divulgação Científica.

**RESUMEN**
Este trabajo analiza la relación asimétrica entre lo tiempo de la investigación científica y lo tiempo de los diversos segmentos interesados en sus resultados, sobretodo con la demanda por el consenso sobre los campos de la ciencia que exigen investigaciones rigurosas y pruebas. Destacase, sobretodo en los últimos años, presiones de los sectores de la sociedad, interesados en el proceso decisorio sobre la dirección de la ciencia, entre otros lo periodismo científico, lo poder legislativo y la opinión pública. Como ejemplo, fue analizado el proyecto de la Ley de Bioseguridad, que permite la investigación con las células troncales embrionarias en Brasil. Los resultados permiten distinguir que la relación asimétrica entre los diferentes tiempos (de la ciencia, divulgación científica, opinión pública y poder público) contribuí con lo desarrollo del diálogo sobre política científica y la construcción de consenso sobre la dirección de la ciencia y consecuente democratización del hacer científico.
**Palabras-clave:** Ciencia. Conocimiento. Opinión Pública. Divulgación Científica.

## INTRODUCTION

The relation between time and science is beginning to take shape in the concern of the studious persons and researchers who deal with the scientific findings of the last decades. Since science has become attractive to the public opinion, especially with the contribution of the scientific journalist and the scientific disclosure, researchers ask themselves about the distinctions (as well as pressures) that occur in the time of science, of the journalism and of the pertinent political decisions.
The evolution of the scientific knowledge itself, represented by the philosophy of the hegemonic science until the first half of the 20th Century, as a continuous, progressive and cumulative work[1], starts to represent, after Kuhn's scientific revolutions, discontinuous leap in which the paradigms supposedly incommunicable follow one after the other from time to time. In this new perspective, science evolution time has chronologically longer periods of continuous progress, interrupted by relatively shorter periods in which great epistemological changes occur, the so-called "Scientific Revolutions" (Epstein, 1988).
This essay is a deeper and revised version of a master's dissertation chapter (the different times which involve stem-cell researches), whose motivation was to establish different interests and pressures upon the scientific work, especially when it presents ethical implications and consequent clash of various social actors. The dissertation, entitled Zeus X Prometheus: the discursive clash in articles that are favorable and against the embryonic stem cells researches, was presented in March, 2008 in the Science of Communication Post-graduation Program at Universidade Metodista de São Paulo/UMESP (Methodist University of São Paulo).

### Science Time

When the relation between time and science is approached, mainly in the light of the recent findings of the biomedicine, other times (and interests) shape this relation. The journalist seeks for scientific information, pressed by the eagerness of the public, who searches for miraculous panaceas able to

[1] In the epistemological limit of this linear perspective, the Vienna Circle vigorously defended the idea of a unitary and continuous science, insisting in the formation of a unitary language of science, in which each scientific statement could be uttered. (Carnap, 1938, p.41).

lengthen life. The public power seeks for regulation and judicial ordinance, pressed by scientific community sectors or by conservative groups worried about moral aspects.
This chronological circle of interests and demands, sometimes, can contribute to the advance, the inertia and the dysfunction of the scientific activity. Each demand of these different times (of the science, of the journalism, of the public opinion and of the public power) press in different ways the science work so that their objectives are achieved quickly. Then, there is a lack of pace or maybe an asymmetry between the relation of the science time and the consumer-of-science public opinion time. While the public looks for 'truths' based on the science work, it points to transitory certainties, that may be confirmed, refuted or even transformed as the scientific knowledge is built.
This increase in demand for the results of science, consequence of the reduction of the modern emancipation to the cognitive-instrumental rationality of science, increasingly imprisoned to the market principles, tends to mask and sharpen the known deficits and excesses caused by science:

> The promise of the domination of nature, and its use for the common benefit of mankind, has led to a careless and overexploitation of natural resources, to the ecological disaster, to nuclear threat, to the destruction of the ozone layer, and to the emergence of biotechnology, of the genetic engineering and the subsequent conversion of the human body into a commodity. The promise of a perpetual peace, based on trade, on the scientific rationalization of the decision-making processes and of the institutions, led to the technological development of war and to the unprecedented increase of its destructive power. The promise of a fairer and freer society, based on the creation of wealth made possible by the conversion of science into a productive force, led to the plundering of the so-called Third World and to a growing gap between North and South.(Santos, 2005, p. 56).

The well-known ethical debates about the scientific work of the last century give way now to the issues involving involve relations among science, technology and society (Latour, 2001). Jean-Francois Lyotard also denounces the overthrow of the postmodern thought and project, when distrusting the links between science and human collective:

> I do not see what this has of human, if we understand by human the collectivities with their cultural traditions. I am sure that this inhuman process may have, besides its destructive effects, some good consequences for humanity. But this has nothing to do with the emancipation of man. (Lyotard apud Latour, 1994, p.61).

**Time of the Scientific Journalism**
The task of the scientific journalism to divulge the progress of science and satisfy the curiosity of readers, has a diametrically shorter time than the time of science. While it needs years to produce new therapies and drugs, scientific journalism intends to announce now, at least the therapeutic potential of a new procedure or drug. It is common, in recent years in which there has been a growing interest in the scientific disclosure, especially that dealing with therapies and pharmacologies to cure cancer and other diseases, reports of drugs that are still being developed to be conveyed as "promises of healing". Thus an asymmetry occurs among the times of patients in need of healing, of scientific disclosure, of scientific research itself and of the normative legal procedures. This asymmetry can be explained by one of the values of the journalistic news, which is

the latest of the new and unexpected fact, often contradicting acclaimed scientific theories, hence its "unexpectedness".[2]

> The event, then, is all that breaks into the smooth surface of history among a random but constant multiplicity of virtual facts. Because, for journalism, a simple fact, inconclusive, supposedly true, becomes the raw material to get to the product news (Sodré, 1996, p.132).

**Time of the public opinion**

As a result perhaps of the own "builder" feature of the scientific journalism news, we can speak of the time of the public opinion. Divided between the "miracles" of science and the "hell of Prometheus", such Manichaeism when it comes to biotechnology, the population starts to have in the scientific disclosure a messianic ally to trumpet hopes for degenerative diseases or the coveted "elixir of youth", something able to prolong life or reduce the effects of the time on health. Add on the recent work of health advertisement, which confuses the illusion of well-being and quality of life with the promises of certain medications.

Often doctors complain of anxious patients after the disclosure of a "supposedly" therapy still undergoing experiments.[3] Usually they have to explain to their patients what, probably, the scientific disclosure have not done adequately: the therapy is still a promise, a line of research that can be materialized (or not) in a few years.

As for therapeutic cloning and the Biosafety Law, patients suffering from degenerative diseases not only followed but also enlisted as supporters in lobbying for the approval of the law. On the one side there is the anxiety for the cure,

planned for a decade or two of studies and experiments, on the other side, there is strong opposition from conservative groups that are against embryonic stem-cell research. For someone who suffers from a degenerative disease, any delay in passing a law permitting research that will produce benefits in a few years, may seem an eternity (Oliveira, 2007). What not to say then of the suspension of embryonic stem-cell researches with the filing of the Direct Action of Unconstitutionality (ADI 3510) on article 5 of the Biosafety Law, whose merit was only tried in mid-2008. It was three more years in the long process of the law.

> For contemporary historians, human beings moved from the dominant Time of nature to the Time dominated by man and then to man dominated by Time (Glezer, 1992).

**Time of the political decision**

Since science has replaced religion in the new lay and secular societies, politics has become a social field of a temporary characteristic with unsatisfactory solutions to problems that could only be adequately addressed if they were converted into scientific or technical issues (Santos, 2005, p.51).

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[2] The convergence of the "value" news in journalism and in science can be seen in the headlines of major international science magazines (*Scientific American, New Scientist, etc*.), whose cover story headlines show frequent "beats" with new theories opposing the already acclaimed ones.

[3] It is worth to highlight the front page report of the *New York Times*, (May 3rd, 1998) about two new drugs (angiostatin and endostatin), blocking agents of the development of blood vessels, which were shown promise in treating cancer in rats, hindering the blood flow in tumors. In the following days, desperate patients telephoned ontological clinics to get the two natural proteins, which had not even been tested in humans, but which made the shares of the laboratory in charge soar in the Stock Exchange. It is possible to see in this event how in the initial news overlaps an undeniable journalistic impact, a scientific value at least debatable (treatment for cancer in humans) and a considerable economic effect.

These unsatisfactory solutions may well exemplify the time which corresponds to the decisions of the public power, as well as its difficulty in generating rules for science policy issues.
It is this terrain that intensifies the political, philosophical, ethical, moral, religious, legal and economic controversies. Aware of the therapeutic capacity of research in biotechnology, legislature and judiciary powers do not ignore the limits of scientific discovery, but are constantly besieged by interests either economic of these studies, either moral and conservative of certain sectors of society, not to mention the interests of the scientific community itself. To this harassment, it is added the subordinated participation of modern Law, since the moral-practical rationality of the Law, to be effective, had to be subjected to the cognitive-instrumental rationality of science. The scientific management of society had to be protected against possible opposition (Santos, 2005, p.52).
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> In the United Kingdom, there is a recent movement of criticism on how science has become far apart from society. Science and scientists are far from the contact and people's concerns. it is still criticized the distinction it is often made between science and society or between science and its applications. Society must draw the limits of scientific application and decide how this should become part of everyday life. Science itself, as a search and a process, should be free, but its applications affect everyone (Shakespeare, 2005, p.483).

The need for consensus to unite divergent interests and with different temporal demands (some players are moving faster than others) makes an intricate relationship to be established on the legislature powers of these countries. As the time of science is much slower than the time of scientific journalism, the time of the public opinion and the public power's own time, responsible for the legal system or by what has recently been called "biolaw," legislators are in a great dilemma: to build, fast, secure norms for society and the scientific community, without having to do so, sure knowledge about benefits and risks involved in the scientific research in question. A recent example was the pandemic of H1N1 influenza in August, 2009, when the public power sought to compel the Brazilian government to distribute the antiviral Tamiflu[4] to people with the symptoms of the new flu. At the same time the actions were filed, two important studies in Europe showed side effects of the medication in children (OLIVEIRA, 2010, p.401-405). That is, the different times involved compete with each other so that there is, properly, an agreement that enables the legislator to regulate the law in science policy.

**Time of consensus**

The above issues, specific to each segment interested in the developments of scientific research, give rise to two types of issues. The first is whether the decisions of public interest - as is the case of research with embryonic stem cells - must be taken in accordance with a schedule established by the political sphere and not by the scientific or technical one. These decisions will be taken before a scientific consensus has been achieved precisely because, generally, the time of the political decision is much scarcer than the time of the scientific decision.
The second issue arising from the previous one, is to know how to make a decision based on scientific knowledge before there is consensus among scientists themselves. The dilemma is in the need and urgent interests of different segments of society in the results of science. However, as the researches go more slowly than the demand from these segments, the public power often finds itself pressured to make decisions of a scientific nature even when there is no consensus among scientists about risks, scope and benefits of certain therapies.
Concerned about the gap between public consensus and scientific consensus, Collins and Evans (2002) highlight some doubts arising:

[4] Trade name of the drug Oseltamivir phosphate, Roche Laboratory, indicated for the treatment and prophylaxis of influenza in adults and children between 1 and 12 years old.

1. Should the political legitimacy of technical decisions in the public domain be maximized by referring them to a broader democratic process or should only be based on best expert opinion? The first choice can lead to a technological paralysis. The second one calls for the increase of the opposition of the more enlightened public.
2. On issues in which both the public opinion and the scientific community have contributions to make and that have undergone only the exclusive domain of technicians, what is the value of the technical-scientific knowledge in relation to the lay public knowledge in general?

The above issues converge to a specific problem of the relationship involving scientific research and the interests of different actors: How to make decisions based on scientific knowledge even before the scientific consensus has been formed in order to provide secure foundations for the political decision? With so many interests involved, pressures from conservative or favorable groups, as well as the lobby of the financial groups that sponsor scientific research, controversies and concerns that reflect in the mass media agenda setting arise, what enlarges the sphere of discussion for the public opinion, creating what some researchers call "temporal public sphere"[5], when citizens are "invited" to take sides in an argument. The controversies come to the public, and after it, they are fed back to the segments concerned, in a cyclic process of discussion and intensification of debate.

**Conflicts of interests**

The "cultures" or ethos of science and journalism might engender some conflicts of interest, some of which we will try to identify:

**1. Generic interest of the progress of science (I1)**: Find the widest possible publicity of the results of primary communication. At this point opinions are divided between those who advocate a broad and unrestricted publicity and just the wide publicity of the researches already established by the procedure of evaluation "by peers." The wide publicity of science corresponds to one of the ethical imperatives of science set out by Merton[6].

**2. Interests of producers of scientific knowledge (I2):** Find a balance between the wide publicity (I1) and ensuring recognition of the priority of research results (I3). In short, the "system" of science admits a vector of cooperation and another of competition among scientists themselves. The composition between these two vectors of variable value, in accordance with the disciplinary sector, the economic interests involved, the importance of research, values of the actors involved, etc., provides the direction and strength of the resultant vector.

**3. Interest of printed journals (I4)**: Do not allow that the publication of its material, already reviewed by peers, is given to the public before the day of the release of the printed edition.

**4. Interest of journalists (I5)**: To have the highest precedence in reporting the results of research (primary communication) to the public (secondary communication). A conciliation between the interests (I4) and (I5) is the system of embargoes.

The embargo system seeks to conciliate the interests of the journals (I4) with the interest of the journalists (I5). The embargo is a "gentlemen's agreement" whereby the public use of the information is prohibited until a specific date that coincides with the date of publication of the journal that holds the information. Both *Nature* and *Science* used to send to more than one thousand journalists around the world the material to be published in the magazine the following week

[5]Burke and Briggs, rereading Habermas, distinguished two types of public sphere: the temporary and the permanent, or the structural and the cyclical. According to the author, in the Protestant Reformation and the American and French Revolutions, the elites involved in the conflict appealed to the people and the print media helped raise the political consciousness. The crisis created lively debates but short on a temporary or cyclical public sphere (Briggs, Burke, 2004, p.109).

[6]Merton enunciated four institutional imperatives of the ethos of science: universalism, communism, disinterestedness and organized skepticism (Merton, 1967, p.552-561).

(Marshall, 1998, p.860-869). The journalists then have a few days to consult other sources, to study the issue and to develop their stories. Journalists, in turn, agree not to leak any information until the date of publication of the magazine.
The embargo system has its supporters and its detractors. The former contend that by this system journalists have more time to prepare their stories, journals retain their uniqueness, scientists themselves make more accurate exposure and the public gets better information. Those who are against the system claim that nothing can justify any delay in publication of research results, the holdback period is arbitrary and especially in the case of primary medical journals, the editors do not want the subscribers to their publications (who are doctors) to be surprised by news in the media before having the number of the journal in hand.

**The Law on Biosafety**

To get an idea of the interests involved in the process involving the Biosecurity Act (Law 11105), just remember that it began in October 2003, when it was sent as a government bill to the House of Representatives. Its approval with modifications occurred after 14 months of processing. The original text has been changed greatly, especially with the restriction on the power of the Comissão Técnica Nacional de Biossegurança - CTNBio[7] (National Biosafety Technical Commission) and on the research with embryonic stem cells. Then the Senate returned the possibility of research with embryonic stem cells and expanded the powers of the CTNBio. Next, the project returned to the House of Representatives, which approved the basic text of the new law on the night of March 3rd, 2005. On March 24th, 2005, President Luiz Inacio Lula da Silva signed this law, without changing the text, with the expansion of the power of decision of the CTNBio on genetically modified organisms - GMOs - (transgenic) and the release of stem cell research obtained from embryos frozen for more than three years by *in vitro* fertilization.
During the course of the project of the Biosafety Law, deputies linked to the Catholic Church tried to remove the article on embryonic stem cells after disclosing the letter of the Conferência Nacional dos Bispos do Brasil - CNBB (National Conference of the Bishops of Brazil) with this request. During the vote on the bill in the House on March 2nd, 2005, members of the Associação Brasileira de Distrofia Muscular (Brazilian Muscular Dystrophy Association) and the Movimento em Prol da Vida (The (Pro-life movement) attended the meeting. People suffering from progressive degeneration of muscle tissue and relatives of patients with neurological diseases such as Parkinson's and Alzheimer's disease, and diabetes, which can be helped by stem cell research, also pushed for the approval (Almeida, 2005).
The intense debate in this process, which lasted nearly two years, did not end with the sanction of the law. In June 2005, the then Attorney General of the Republic, Claudio Fontelles, filed the ADI 3510 in Federal Supreme Court (STF) against Article 5 of the Biosafety Law, which authorizes the use of embryonic stem cells. Fontelles' argument, a fervent Catholic, was that the use of these embryos offended the constitutional right to life and to human dignity, for whom the embryo is human life. The merit of the ADI 3510 has only been tried in the sessions on March 5 and 28 and May 29, 2008, when the Law was held constitutional by six votes to five in the STF.

**New routes for science**

As one can see, the legal permission to conduct research related to biotechnology involved a public, technical, political, legal, religious and scientific discussion, whose conclusion did not occur in a short period of time, because the process lasted nearly five years. It may seem long, when compared to countries that already do research on embryonic stem cells. But it is a very short time, much less than science is able to define with certainty all the risks and benefits, besides its own reflection on its deviations and deficits. The time of politics, driven by the public opinion and the press, pushes down the throats ethical discussions, whereas the time of science counsels a cautious hold.

[7] Composed by 12 scientists, 9 government experts and 6 representatives of society, responsible for the final word on the harmlessness of GMOs (transgenics) to human health or the environment.

Recent phenomena such as this signal the maturing of the sectors concerned about the risks and effects of these researches, and bring out the warning of a social order grounded in science, i.e., in which the determinations of law are the result only of scientific findings, even because it is clear the signs of crisis in the reconstructive management of the excesses and deficits of modernity (Santos, 2005, p.54).

Different researchers have tried to discuss the finding of deficits and abuses of science, as well as overcome the discussions that can not overcome the lack of guidelines and proposals for a "new science". It probably occurs, in this theoretical field, more pessimism and hopelessness than concrete strategies. It is very much concerned with a new ethics (Jonas, 1995), the dignity of human life (Habermas, 2004), prudent knowledge (Santos, 2005), the instrumental and utilitarian character of science (Lacey, 1999). However, there are few, and perhaps plausible proposals to redirect the path of science, increasingly bound to the mechanistic principles of the cognitive-instrumental rationality, perhaps because, as Santos states, "the prediction of the consequences of the scientific action is necessarily much less scientific than the scientific action itself" (2005, p.58). Another obstacle is that neither the population nor the government, the legislature or the private sector are really interested in turning concerns into concrete actions, according to research from the Instituto de Estudos da Religião – ISER (Institute of Religious Studies) in Rio de Janeiro[8].

However, new paradigms come out such as Michel Serres's natural contract, i.e., a non-signed agreement that recognizes a balance between "the strength of our global interventions and the globality of the world" (1991, p.59). Latour also notes the recent reactions of nature to human interventions as a key to understanding the non-modernity of the world we live in - retention of the excesses of reason and its dualisms, critical thinking, or a retention of the relations of property and reason domination about their objects of knowledge (Latour, 1997).

In another routing against a society revolutionized by the dominant paradigm of science, Santos proposes the paradigm of a prudent knowledge for a decent life, through the two dimensions of the principle of community, participation and solidarity. In this paradigm knowledge-emancipation, solidarity becomes the hegemonic form of knowledge (2005, p.74-79). For him it is necessary to "relativize the cognitive pretentions of cognitive-instrumental rationality," in recognition of the limits of knowledge as a way to rescue the epistemological traditions marginalized in Western modernity (2005, p.103). In this relativization, he perhaps approaches the theoretical or epistemological anarchism of Feyerabend, who sees science as an anarchic development, whose progress also cannot overcome relativism, i.e., one can only talk about the progress of science from every tradition, every culture, every community and depending on its needs and expectations (1989, p. 43-70).

Thus, we cannot forget that the mechanism to promote these strategies, if not exclusively, goes mainly through the public consensus or the collective wisdom. We should not forget the general public (or a specialized portion of it) to transact, among specialized groups (the scientific, legal, intellectual community, etc.) the interests, risks and choices to guide the scientific activity. Consensus should be built taking into account the different times involving the scientific production, the legal work and the scientific disclosure, in addition to damages and interests involving the scientific processes (COMEST cited in Lacey, 2006, p.374). Principles such as responsibility (Jonas, 1995), caution (Lacey, 2006), prudent knowledge, solidarity and participation (Santos, 2005), natural contract (Serres, 1991), will never leave the theoretical and moral field in a depoliticized society if not engendered with the formation and empowerment of a public opinion, even because "the solution of problems arising from the lack of scientific knowledge, only surpassed in the long term, was given the law" (Santos, 2005, p.185).

## Final Remarks

[8] For the social scientist Samyra Crespo, on research funded by the British Embassy in Brazil, representatives of the media, the National Congress, NGOs and the private sector will only forward proposals to fight global warming if there is an effective public outcry (Geraque, 2008).

As neither a new deontological ethics, nor a new legal system are exempt to generate a new paradigm in modern science, it seems reasonable to continue to believe in the formation of public consensus interested in building values, principles and responsibilities for science that are not a scientism in the service of political, commercial, industrial and military interests, or of a legal-moral dogmatism to restrict the scientific activity. It may sound utopian, as well as to believe in a philosophical or scientific knowledge that is emancipator, but may well be "an intellectual utopia that makes possible a political utopia (Santos, 2005, p.167).

> In the United Kingdom there is the understanding that "scientific debate must be dominated by experts." Ordinary people fear not to know the technical details about a particular subject. It turns out that there are the technical experts, there are the ethical experts and the theologians. And they all think the have the right to say what is right and what is wrong. The problem is that the results of science are often counterintuitive or unknown and rejected by ordinary citizens.
> The reason why the dialogue on the progress of science and technology should be larger is that we are all affected by science and medicine. We should also vote on issues related to research and health care (SHAKESPEARE, 2005, p.484)

In this respect, it seems fair to say that there are already major players in this field, initial trainers of this consensus, as scientists and philosophers concerned with ethical issues, forums and research institutions engaged in the course of science, specialized sectors of science disclosure, etc., although one can identify in them the presence of different interests, as well as in scientific activity itself.

> This will be, in my opinion, the most effective way to fight against monopolies of interpretation and, at the same time, to ensure that the end of monopolies of interpretation does not necessarily imply the renunciation of interpretation. The idea that the politics concerns only the space of citizenship is one of the main *topoi* of modern political discourse. The modern social sciences and their applications to public policies and to scientific popularization, helped consolidate this *topos* as essential premise of modern political common sense. It is the task of the newest emancipatory rhetoric to object to this premise and refute the restricted idea of politics until it ceases to be a premise and passes to be the object of argumentation (Santos, 2005, p.114).

## COLLABORATORS

The authors worked together during the production of the manuscript. The second version, with review and adjustment, as the editorial board's opinion, was the responsibility of the author José Aparecido de Oliveira.

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