

Social sciences and the English language

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ABSTRACT

The article analyses the predominance of the English language in the globalization context, particularly the implications related to the social sciences. It first makes a critical analysis of the literature elaborated by linguists concerning the expansion of the language in the contemporary world, focusing on the evolution of English from an international to a global language. It then discusses the supremacy of English both in natural and social sciences. The central argument is that such scientific practices are distinct, i.e., having English as lingua franca for natural sciences will make it impossible to have it doing so in the human sciences ambit. Assuming that the construction of the social object is achieved through the language, being it also referred to a specific historic-geographic context, the making of the social sciences must keep several languages in the process. The imposed prevalence of a language happens due to a power hierarchy in the linguistic *métier*, within which there has been an erroneous nearing between the ideas of universal and global.

Keywords: Globalization; Modernity; Culture; National identity.

Globalization is preferably declinable in English. Preferably, I say, for the presence of other languages is a characteristic of our times, and, nevertheless, a sole language, among so many, holds a privileged status. There are objective reasons for things having developed in this fashion, and those reasons have nothing to do with phonetic or grammatical groundings; although many have done so, it would be foolish to think about the existence of the languages in a substantialistic way. Linguists teach us that every language is able to express the human experience under the form of concepts, so there is no such thing as a superior language. Furthermore, we know that only humans have a language coherently articulated in a complex system of signs, and that the diversification of the languages is something that has occurred quite early in the societies of the past. Regardless of the available and not confirmed hypotheses about the origin of the languages – monogenesis or polygenesis --, the truth is that, as soon as they were put into action, they evolved in separate communities, spreading across several regions of the planet (currently there are some 6,500 languages being spoken in the world). Taking into consideration such diversity and the impossibility of the existence of a universal language – it would be necessary that all human experiences converged to a sole source of meaning – it would be unwise to base our discussion on the proposition of a univocal world. The globalization process is not a synonym of homogenization, nor of Americanization; it is a condition in which the hierarchies and force lines surely exist and are

unequal, but they do not necessarily imply the elimination of the diversities. In this sense, the disappearance of the national languages, idealized by some as equivalent to the universal brotherhood (that was the belief of Kautsky and many scholars of the II International), and by others as a nightmare, is a false problem. Notwithstanding, this introductory note of caution does not elucidate much about the topic in question, for it does not regard the unicity of the languages, but concerns the fact that they participate in a globalization situation marked by power relationships.

The diligent, patient, reader notices that the best part of a whole literature regarding the scattering of English across the world is relatively recent. It developed particularly in the late seventies and along the eighties, when a series of books was published about such scattering in an international scale.¹ The authors wished to document empirically the presence of English in several countries and spheres of activity – from science to propaganda – as well as understand the reasons leading it to occupy such situation of preponderance. Two factors stand out in this kind of study. The first one concerns the standard; in face of the existence of established references – the British and North-American standards --, the diffusion of English raised a problem: how to understand the idiomatic variations, which did not fit in the model, existing in countries whose official language was the English one? Would it be more appropriate to use the expression “English language” or “English languages”, singular or plural?² Kachru, an Indian linguist, considers that the nativization of English would result in the creation of an autonomous model, original, different from the British legacy, but equally valid. Others extrapolate their investigation methodology, applying it to different regions of Asia, which means putting up the legitimacy of regionally developed varieties to the level of the exporting matrices, England and United States (Kachru, 1982; Parakram, 1995). Therefore, there is a dispute between the English speaking countries about the existence or inexistence of a sole standard (or two, at the most), which is able to classify the hierarchy of the speeches. The discussion about the standard, predominant among the foreign languages teachers (they seek “the best” for their pedagogical activities, reaffirming the North-American and British excellence all the time), is based on a misconception, whose concealing generates political and cultural dividends. It is the ratification of a hegemony travestied as a linguistic truth. This discussion comes from ancient times. Since the formation of the nation-state, in which the language monopoly was one of the ultimate traits in the process of national integration, the demand for a reference generalized to everybody aims at opposing the other existing speeches. Bourdieu reminds us that the French Revolution had as a purpose to impose a legitimate language against the regional idioms and dialects: “the conflict between the French language of the revolutionary *intelligentsia* and the idioms is a conflict regarding the symbolic power, whose objective is the formation of the mental structures. It is not just about communicating, but also about recognizing a new discourse of authority” (Bourdieu, 1982, p. 31). Those tensions are not situated only in the past; in a recurrent fashion, they are updated in face of the proliferation of conflicting languages within the same geographic area. That is what occurs in the United States, where the English Only movement, an ardent advocate of the monolingualism, has established as a goal to disqualify and restrain the immigrants’ demand for a bilingual education (Willey and Lukes, 1996). On what concerns to English as the international language, the dispute regarding authority is not confined to the boundaries of a nation; it involves countries with differentiated histories and cultures. However, the terms of the discussion are similar, for, after all, the postulated standard has no empirical reality; it is simply a concept imagined by those holding a position of power, who believe that such standard confers them a certain ability – the ability of “correcting” others. Its existence is invoked as a justification for the control and safeguard of the language of origin. The controversy with regard to the existence or inexistence of a standard occurs especially when the speakers are involved in the dispute. That is why, up to this day, in moments of tension (a globalization situation), the controversy reappears in full force, and often with switched signals. As an example, we have the dispute developed about the Toulon Law, which officially regulated the utilization of foreign terms

by the French language. Here, the notion of standard is recovered as a previous stage of “purity” being threatened and corrupted by the excessive use of English (Durand, 1996).

A second factor concerns the Anglocentric dimension of those studies, and, quite often, the ideological pretense in which they are involved. They are marked by a profound optimism and an undisguisable feeling of superiority, as if the expansion of a language was really a synonym of civilization and progress. In face of the undeniable picture of the empirical evidence, the sentence “no other language has undergone similar expansion since Greek and Roman times” is proudly repeated over and over. Those analyses lack the slightest trace of an objective criticism, and they lead us to believe that the magnitude of a language is exclusively due to the diglossic strategies of the speakers. The major argument underlying this theoretical trend can be summarized as follows: a second language is learned only when the speaker estimates to be able to obtain advantages in the use of another language, whose range of action is broader. I quote one of those investigations conducted at the time. The authors, after describing a series of factors that could eventually influence the diffusion of English – political opinion, religion, urbanization, economical development, linguistic diversity, military presence - conclude:

To say that English is spreading around the whole world as a result of a combination of variables is a summary statement, based on the countless interactions and motivations of the human beings. It is the individuals, not the countries, that learn English as a second language. And they do so not due to abstractions, such as the linguistic diversity or the balance of payments, but because the knowledge of English helps them to communicate within a given context, in which, for economical, educational or promotional reasons, they wish to communicate with others and the opportunity of learning English is available. The statistics utilized here show some symmetries and regularities, but we cannot forget that the human behavior precede them. Therefore, the study of the languages diffusion should result not so much from the manipulation and analysis of abstract and summary data, but from the direct observation of the human behavior. [...] That is why the data of a specific context should be regarded as secondary, as a matter of fact very distant from the quotidian arena in which the languages are learned and abandoned (Fishman, Cooper and Rosenbaum, 1977, p. 106).

Thus, the use of English would originate from the advantages that it offers to its users. Its statute is, therefore, of neutrality, and it functions mostly as a more comprehensive means of communication. At this point, linguists with different theoretical trends converge to a same diagnosis. It is the case of Kachru, an unyielding opposer to the concept of the existence of a British or North-American standard. When it comes to understanding its presence in India, in contraposition to other existing languages, he tells us: "English possesses a clear linguistic advantage: within the context of the native languages, dialects and styles that often present an undesirable connotation, it has acquired a linguistic neutrality [...]" (*apud* Pennycook, 1998, pp. 9-10). This is obviously illusory, for its use in India is marked by political contradictions and ideological controversies (Sonntag, 2000). However, it is important to emphasize that the previous argument, the one about the functional neutrality, is reaffirmed. From this perspective, the expansion of English would nor simply be something to be proved, but a benefit for everyone. The linguists seem to reason just like the culturalist anthropologists of the forties, who assumed that the acculturation process derived exclusively from the contact between two different cultures, regardless of the context in which such interaction occurred. Thus, the explanations regarding the religious syncretism, the African messianism, had nothing to do with the colonial situation of the involved actors; the facts of such nature were seen as external, alien to what was happening.³ That is why among the culturalist anthropologists, as well as

among the linguists, colonialism and imperialism are taboo themes; after all, as a last resort, they would have a relationship of exteriority to what one sought to understand.

But the considerations about English become even more troublesome when the texts of a specifically ideological nature are aggregated to them. Among others, I recall the book by Jeremy Tunstall, *The media are American*. With an ample factual documentation – regarding the television, cinema, propaganda, and press -, he strived to understand the North-American predominance in the world. His concepts are exemplary:

English is probably the most influenced and tuned language to the use of the communication media [...]. The media in English is relatively exempt of the separation between the high and vulgar forms – compared to German [...]. In English there is also a slight discrepancy between the written and spoken forms [...]. As a language, English evolved with and by means of the communication media, particularly the press [...]. English contains the greatest variety of incisive sentences and simple words, which may be chosen for the use of the communication media, as compared, for example, to French; the version in English is usually more concise than in any other language. Furthermore, English possesses the simplest grammar in comparison with any other competing language, such as Russian. The English language is the one that best suits the comics, newspaper headlines, impressive phrases, picture subtitles, pop songs, disc-jockey jests, flashes and songs for advertisements (Tunstall, 1977, pp. 127-128).

It is not only about communicative neutrality or diglossic advantages any longer; in its “essence”, English would be intrinsically superior to the other languages. Being the language of rationality and modernity, English would be the primary reason, not the expression, of the North-American supremacy (a lot of this ideology is still displayed in the common sense in times of globalization). The strong reaction to this apparently naïve approach, but which in truth needs to be analyzed, should be taken into consideration; and, in my view, it has had important, positive implications on the understanding of the current set of problems. In this sense, the book by Robert Phillipson, *Linguist imperialism* (1992), possesses the merit of introducing new parameters into the discussion, particularly the role played by the colonialism and imperialism in the configuration of the present world. From this point of view, the colonial legacy, associated to the capitalism expansion, would not be limited to aspects of a merely economical nature; its implications would extend to a domain that, until then, had been excluded from its scope of influence by the linguists. The Phillipson’s text opens the door to others wishing to write about English “as an ideology”, causing the reasons for its expansion to cease to be found in its internal properties or in the mere interaction between the participants in the speech. It is this very dimension, previously seen as an exteriority – the political, economical and military organization of the interests, regarded as irrelevant or secondary for the analytical understanding -, that becomes decisive for the explanation. David Crystal, who has been interested in the English dispersion around the world for so long, writing a little later and, in a certain way, reviewing his previous point of view, can then say:

A language does not become global as a result of its structural properties, the size of its vocabulary, for being the vehicle of a great literature of the past, or for having been associated to a great culture or religion [...]. A language becomes international for a more important reason: the political power of its people – especially their military power [...]. But the international dominance of a language does not originate only from the military force. The military power of a nation may impose a language, but an economical mightiness is necessary to keep it and expand it [...]. The growth of the businesses and of a competitive industry has

caused an international boom of the marketing and business [...]. The technology, in the form of movies and disks, has canalized the new forms of mass entertainment, which had a worldly impact. The impulse to the science and technology progress has created an international research environment, granting to the academic knowledge a high degree of development. In the center of such explosion of international activities, any language would be suddenly raised to a global status (Crystal, 1997).

The reading of this literature also allows us to formulate a question: in which extent is it distinguished – or not – from the discussion about the globalization? Is there any conceptual discrepancy between the expressions "English as an international language" and "English as a global language", or would they be the outcome of terminological inaccuracies of no consequence? I believe in the existence of substantial differences, and it is important to emphasize them. First, there is an expressive disconnection between the performed studies and the texts about globalization, although the best part of them is contemporaneous.⁴ However, we must keep in mind that, along the eighties and in the early nineties, the reflection about the globalization was limited to some specific domains – propaganda and business management (I mention the literature about the global marketing). The social sciences paid it little or no attention at all, for the field of ideas was polarized between modern and post-modern -- Habermas *versus* Lyotard. Even the Phillipson's book, published in 1992, is not exempt of this observation, since it is based on the traditional definition of imperialism (Hobson, Lenin), accepting some incorporations by the theoreticians of the dependence – the globalization is excluded from this discussion. On the other hand, in the studies conducted by the linguists, is noticeable the constant presence of two terms: diffusion and dispersion; it is symptomatic that one of the key-texts on the matter bears the title of *The spread of English*. I believe that, at this point, the comparison with the anthropologists can be recovered, but now in association with the diffusionism.⁵ Kroeber said that the

[...] diffusion is the process by which the cultural elements or systems spread. It is obviously connected to tradition, since the material culture is transferred from one group to another. However, as it is usually construed, tradition regards the transmission of cultural contents from one generation to the next (within the same group of population); the diffusion occurs from one population to another. Essentially, tradition works in terms of time; diffusion, in terms of space (Kroeber, 1963, p. 139).

Therefore, the definition presupposes the existence of an irradiating center and of a common space shared by distinct cultures. That is why the diffusionism is so interested on the comparison between civilization areas and the migration of cultural traits from a given area to another (acculturation and syncretism). The argument postulates as well a clear distinction between internal and external, the elements pertaining to a "starting-system", source of the irradiation, and those situated at the "finishing-point". The diffusion would express the moment of contact between two cultures, two civilizations. The linguists ratiocinate in a similar way. English is a language that possesses its own history and centrality, and which, by different mechanisms (schools, institutions, religious missions, etc.), is diffused around the world. At the point of contact, when it comes across other languages, the diglossia or assimilations occur. From the speakers' point of view, this means that it is a language distinct from theirs. The criticism performed by the anti-imperialist view is based on the same propositions (Ortiz, 2002). The concept of imperialism presupposes the existence of a center, the nation; it is the nucleus of a domain that encompasses the whole planet, apportioning it in accordance with the unscrupulous appetite of a few industrialized countries. Therefore, the imperialism has an identity: it is English, North-American, German, French, Japanese. Each focus of diffusion seeks to propagate and impose its ideas and its way of life to the peripheral nations.

What is external to the national reality of the peripheral countries can then be seen as an alienation, as something extraneous, separated from its “authenticity” (I wish to remind you that the concept of alienation was crucial in the thought of the Third World, both in Latin America and in Africa – it is the case of Franz Fanon).

However, the globalization phenomenon is different from the internationalization one. In the globalization, the nations cease to be autonomous, independent entities, which interact with each other, and become territories washed by the flow of the world modernity. In such context, it is somehow senseless to talk about a diffusing centrality or about a clear opposition between external and internal, foreign and autochthonous. Saying that English is an international language means considering it in its intrinsic integrity, circulating among the nations. Another thing is calling it a global language, that is, a language that crosses the distinct places of the planet. The fact of the studies about its diffusion regarding it as an “additional” element, that is, something added to a pre-existing base, is quite significant.⁶ Hence the insistence on the teaching of a second language. For instance, when an author such as Claude Truchot (1990) analyzes the penetration of English among the French scientists in the eighties, he classically approaches the theme in terms of diglossia. There would be a contact between two distinct codes, one of them high, the other low (obviously, the low one corresponds to French), in which the speaker uses, as a communicative strategy, one of them in availability. The predominance of English occurs because it is the language of the scientific exchanges, that is, it functions as an international language with larger amplitude. Therefore, from the perspective of the scientist using it, English is a “foreign” language. This kind of explanation merits no criticism; but it is important to emphasize that it solves the problem only partially. With the coming of the globalization, it is interesting to know if English possesses only this attribute or if it should be construed otherwise, for its position is entirely redefined. I would say that, in the context of globalization, English is no longer a foreign language, something imposed from the outside, but has become an internal language, autochthonous to the world modernity condition. This is, in my opinion, the meaning of David Crystal’s statement in the introduction of his book *English is the global language* (1997). This changes things radically.

The linguists often utilize the metaphor of ecology, dealing with the languages as if they were ecologic systems. A first definition of the term regards the idea of threatened nature; in this case, the intention is of developing some mechanisms of protection for the species, ensuring the condition of existence of some speeches in adverse situations – for example, the decrease in the number of speakers would lead to the language extinction. This interest in the biodiversity has even led some authors to suggest the development of a linguistic-ecologic policy, focused on the multilinguism, the preservation of the cultures and the respect for the human rights (Phillipson and Skutnabb-Kangas, 1996). I am aware that this perspective of work is important, and that the affirmation of the equality of rights is fundamental in the struggle for the ideal of a fair and unbiased “worldly civil society”. However, in the ecologic metaphor, within the scope of this article, I am interested in the fact that this metaphor reminds us of the spatiality of things. Ecology, as an environment, determines an ambience, a specific territoriality. Well, we know that the globalization process implies a radical transformation of the notion of space, in which categories such as diffusion or imperialism become inoperative (cf. Ortiz, 1996). Then, how should we consider the ecologic configuration of the languages with regard to their environments and to the other languages? I think that the contribution of Abram de Swaan (2001a) is relevant, since it provides us with the possibility of understanding the subject under discussion in its tight correlation with the globalization movement.⁷

The individuals not always have the possibility to choose their languages; this attribution is performed in the topographic context in which they live. But which would the cartography of the globalized world be? Swaan abandons the two-dimensional idea of planes – the placement of the languages in the space of each country or each culture – by suggesting a three-dimensional design

inspired by the model of the astronomy. The linguistic map may then be imagined as a galaxy, comprising suns, planets, satellites, articulated to the same gravitational system. It is possible, this way, to distinguish constellations internal to this universe, the world. The bilingualism of the individuals (but not necessarily of the totality of the planet's beings) would have the task of organizing the communication between the different parts that form this universe. Most languages, 98%, would be situated at the lower portion of this universe; they are the memory languages, unwritten, but which would contemplate a restricted number of speakers -- 10% of the Earth's inhabitants. The peripheral languages would gather around a central one, as if they were moons gravitating around a planet. The central languages, some one hundred of them -- such as Quechua, Bambara, Czech, Romanian, etc. -- in their majority, but not exclusively, are national languages, used in the press, radio, television, court rooms, and in the state bureaucracy. Above those would be the super-central languages, whose range of action is broader, no longer restricted to the boundaries of a sole country. They would be the suns around which the planets (central languages) and the satellites (the peripheral ones) would evolve. Twelve languages would belong to this group: Arab, Chinese, English, French, German, Hindi, Portuguese, Japanese, Malay, Russian, Spanish, and Swahili.⁸ Each one of them would constitute a constellation, and English would occupy the hyper-central position, that is, it would be the nuclear node of this linguistic galaxy. Such model illustrates how the linguistic exchanges are performed within the same ensemble. In this sense, English, as an expression of globality, becomes a structural portion of something that transcends it. Its North-American or British origin becomes secondary. The roots of its previous territoriality are no longer important; the importance now resides in its existence as a de-territorialized and appropriated language, with a new semantics, in the several contexts of its utilization. It is a generalized phenomenon in the sphere of culture, in which many of the national and local traditions are redefined in terms of globalization. It is the case of the Donald Duck character, the Hollywood stars, and the Western genre, which have lost their Americanism; and the same occurs with Doreamon, Pokemon and Yamamoto's haute couture on what concerns to Japan, or, as well, the pop music on what concerns to England. The same way in which they become expressions of a worldly collective imaginary model, the English language, by being re-territorialized in the space of the world modernity, acquires another meaning. By becoming global, it gets free from its previous rooting, establishing an artifact to be legitimately "deformed", "distorted", by the speakers of a same galaxy.

Swaan considers also that every language is a "hyper-collective asset". They are objectively available to the individuals (who, for using them, must go through a learning process) just like the rivers and lakes are part of our environment. Such objectivity allows them to be compared to economical assets. The languages may then be construed as communication standards and networks. The standards are conventions, protocols for the operation of a machine, procedures for coordinating certain actions; the networks are systems of connections, just like the electrical supply system with its cables or the telephony with its signals, which are able to articulate a point in the space to an interconnected totality. There are, in the market, different technical standards for several kinds of competing networks -- PAL and Secam for the television (hence the importance of the choice of the digital standard for the television system of a country); or the programs provided by Microsoft, which run only in some computers. For the individual, it is important to know what benefit can be provided by a given standard, and they may, at any time, change their newspaper subscription, choose another cable television package, and so on. The linguistic loyalty is an extreme case of consumer's loyalty, since the individual cannot change their language easily. It is an interesting argument, but we must extract from it the due consequences. The author states:

[...] every time people choose to use a given standard, subscribe to a private service network, or learn a specific language, they increase the usefulness of this standard,

network or language for all consumers, members or speakers that were already using them (Swaan, 2001a, p. 28).

This means that the practice of English, as a means of communication, affirmation of status, or literary expression, implies the strengthening of the English language's standard in the market of linguistic assets. Its authority is reinforced when people employ it in their daily tasks – from the post-colonialist that publishes his argumentative book in English, to the Brazilian businessman that uses it during his trips abroad. An expressive example of such legitimacy occurs in the field of pop music, in which English is abundantly utilized, regardless of being or not understood by the young consumers. As a matter of fact, the diffusion of such musical genre in a planetary scale does not depend on the difficulty of its decoding. But what does a language that is not understood mean? Bourdieu, in his criticism to the linguistic structuralism, used to say that "listening is believing" (1983). The symbolic forces determine those that speak and those that listen, and the principle of authority is reinforced at the moment in which the communication is completed. Paradoxically, we have got to the point in which people enjoy what they do not understand. They listen because they believe. The language's legitimacy is such that it does without the understanding of those that ignore it.

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English is the language of science. The reasons for that, in addition to those previously presented, are associated to the deep transformations that occurred in the postwar. Science and technology, which until then were evolving in relatively separate spheres of knowledge, integrated in a sole system. The historians teach us that the Industrial Revolution was caused much more by the pragmatic inventions of some individuals than by a wide and systematic scientific knowledge. The scenario of the late nineteenth century is transformed by the second industrial revolution. The electrical industry is a direct consequence of the scientific investigations, as well as the inventions of the telegraph, the generator, the electric motor, and the radio. But it is not yet possible to observe the reverse, that is, a clear and persistent influence of the technological investigations on the functioning of the scientific universe. This tendency is imposed along the twentieth century, and the expression "technoscience" clearly reveals its new dimension. The technologies presuppose a continuous investment of capital, the formation of specialized teams, and the constitution of research laboratories. In the beginning, this is concentrated in the United States, for, when World War II was over, that was the single industrialized country in which the educational and technological infrastructure remained intact. With the expansion of the higher education offered by the universities, and the development of the research institutes, an unprecedented scientific blooming occurs, associated to a technologic policy in which the scientific creations are linked to the discoveries and the improvement of the techniques. The history of the computer is a good example of the interweaving of the economical, military and scientific dimensions in a same project. As a data and information processor, the computer will stimulate a whole field of activities, from the laboratory experiments to the management of businesses (whose range of action is often transnational). Science, technology and management – differentiated spheres of practices and forms of knowledge – get closer to each other as units that feed on and reproduce from the manipulation, control and processing of the information. I do not believe that it would be exaggerated to say that the key-elements of what we know as society of information were primarily elaborated in English (concepts, models, formulas, and procedures).

It is not difficult to follow the coming and the itinerary of this supremacy. To understand it, we may, for instance, observe the changes in the curriculums of the high schools on what concerns to the teaching of foreign languages. Yun-Kyung Cha, using a series of statistical data, relative to all countries of the world, presents some interesting elements for reflection (the data should be taken with caution, particularly in the case of comprehensive analyses like this one; but I believe that they are eloquent) (Cha, 1991, p. 29). In the middle of the nineteenth century (1850-1870), the French

and German languages, together, were taught in 91% of the existing high schools (45.5%, respectively), and English in 8.3% of them. Between 1900 and 1944 those figures changed (English, 39.6%; French, 47.9%, and German, 16.3%), showing a reasonable balance between the languages. Between 1972 and 1986 this picture underwent a definitive alteration: English (72%), French (17.6%) and German (0.8%). Considering that the high school is an important factor in the learning of a foreign language, which is a decisive condition in the world of sciences, we can guess the extent of the transformation in the teaching standard. Another way of approaching the matter is observing the exponential growth of the articles published in English in some scientific areas (Tsunoda, 1983). In mathematics, the *Bulletin signalétique* shows that, between 1940 and 1980, the number of texts in English increased from 49.5% to 71%, while those in French decreased from 31.2% to 6.1%, and in German from 13.2% to 1.6%. The *Berichte Uber die Gesamte Biologie* indicates that the publications in English increased, between 1926 and 1980, from 26.7% to 55.9%, while those in French decreased from 16.4% to 1%, and in German from 50% to 42.1%. In the magazines with North-American origin the disproportion is more evident: *Physics Abstracts* shows that, between 1950 and 1980, the texts in English increased from 70.3% to 88.6%, and the publications in other languages were almost insignificant. Some linguists, among them Richard Baldauf, have formulated historical series that allow us to get a clearer view of the different areas of knowledge.² Between 1965 and 1988, the articles published in English in the area of biology increased from 50% to 75%; in engineering, from 82% to 86%; in medicine, from 51% to 75%; and in mathematics, from 54% to 82%. It is a trend that becomes stronger and stronger as years go by, in all specialties. However, it is not only the articles that confirm this movement; the quotations, or, in better words, the reference works reinforce it integrally. A study conducted on the most significant geology magazines of the area illustrates this aspect quite clearly (Reguant e Casadellà, 1994). In periodicals such as the *American Association of Petroleum Geologist Bulletin* (United States) and the *Journal of the Geological Society* (United Kingdom), the references to texts written in English are practically exclusive (95.5% and 91.6%, respectively). Furthermore, in the publications of other countries, the following are predominant: *Geologische Rundschau*, 64.4%; *Estudios Geologicos*, 40.3%; *Rivista Italiana di Paleontologia e Stratigrafia*, 48.3%; *Engineering Geology* (the Netherlands), 90.2%. So a circuit is closed: the articles are currently written and quoted preferably in English.

Based on the presented statistics, we should not infer that the whole scientific production, or at least its majority, is made in English. Although there are no available data in a global scale, we can argue, and with a great deal of reason, that the scientific literature in non-English languages has increased. It suffices to observe the proliferation of magazines in the most diverse countries and the scientists' participation in specialized meetings and conferences. However, as Baldauf emphasizes, the representation of the English language in the literature surveyed on the major databases has declined. In spite of being regarded by many as representative of the scientific production, the databases, as a matter of fact, form a distorted projection of what is really happening. A great portion of what is produced is simply ignored, due to the fact that it is not formalized and formatted as promptly available information, that is, as information understandable by an ample group of people. There is also a selection among the publications, hence the muffled dispute, among the scientists, about the reliability or non-reliability of the *Science citation index*. However, it is important to understand that a literary *corpus*, operating as a reference standard, is globally legitimated only when made available in English. Hence the strategy of several groups, particularly in the "Third World", of separating their activities in "local" and "universal". The local ones are written in the national language, and their vehicle is the magazines existing in the country; the universal ones concentrate the "upper-class" scientists, whose ambition is to make themselves more visible in the global scenario and whose interest is to publish their works in the already renowned international magazines. In such a case, both the elaboration of articles and papers tend to hold English as an international language (Russell, 1998). Another strategy is to produce magazines

entirely in English or to publish, in the domestic magazines, a significant number of texts in this language. That is what occurs in several specialized publications: *Anales de la Asociación Química Argentina* (53% of the texts in English), *Biocell* (Argentina, 100%); *Brazilian Journal of Genetics* (100%), *Computation and Applied Mathematics* (Brazil, 100%), *Arquivos de Neuro-Psiquiatria* (35%); *Archives of Medical Research* (Mexico, 100%); *Revista de Biología Tropical* (Costa Rica, 41%).¹⁰

The expression “international language” is recurrent. It is usually associated to Latin, a language that was once regarded as the language of knowledge. Such image may be true, but it disguises unconfessed aspects. First, there is an inconsistency, that is, the application of a concept extraneous to the categories of a given period of time. In the Middle Ages, for example, *scientia* was equivalent to “an accurate knowledge”, and applied only to theology, logic, physics, and mathematics (Blair, 1996); astronomy and optics, in their turn, were called median sciences, since they lent their principles to other disciplines; and navigation, accounting, surgery, pharmacy, and building construction were practical specialties, or, in better words, arts. Latin was the language of *scientia*, while the other forms of knowledge, from the median ones to the arts, were expressed in the vernacular. Secondly, in the prevalent hierarchy, using the vulgar language was equivalent to a disqualification or lowering in rank, that is, Latin was not only an international language, but also a prestigious means of communication. In strict terms, we should say that no language “is” international; it just performs, in given domains, the “function of being” international. In this sense, English, within the universe of the sciences of nature, acts as a predominantly “international” language; its role focuses on the transmitted information, minimizing other dimensions of the life in society (status, aesthetics, feelings, etc.). But if this is possible, and this is the element valued by the scientists – in the conferences, a language emptied of other connotations is used with the purpose of maximizing the instrumental communication -, what to say about the social sciences? I take from Barthes a remark that he made when comparing literature and science:

[...] For science, the language is no more than an instrument, captive of the scientific matter (operations, hypotheses, results) that is said; the language precedes science, and exists out of it. Science is interested in making the language the most transparent and neutral that is possible: on one hand, there is, on a first plane, the content of the scientific message, which is everything; on the other hand, on a second plane, there is the verbal form, which expresses such content and is nothing [...]. For literature [...] the language is its very being, its world: the whole literature is contained in the act of writing [...]. Science certainly needs the language, but is does not reside, as literature does, in the language (Barthes, 1984b, pp. 14-15).

We must keep in mind that the quality of being instrumental should not be regarded as something negative, in the frankfurtian meaning of instrumental reason, or, on what concerns to literature, as an impoverishment of the language (although, sometimes, Barthes shows this intention). It is a deliberate option to utilize the language as a tool, whose result is highly rewarding – the scientific discourse. The consequence is the wide consensus (although with no unanimity) existing among the scientists on what concerns to the use of English, that is, the fact of it being instrumental and efficient.¹¹ But what would the reason of such instrumentality be? Richard Harris and Paul Mattick, working with the language properties and their relationship with the information, present an interesting argument. They consider that each scientific domain utilizes the language in a limited fashion, and that is why it is easier to translate scientific than literary texts. This means that the information provided in the message is given not only by the individual meaning of the words, but also by the relationship between them, their co-occurrence and combination. For example, we may enunciate the sentences “for me it is preferable being the last to leave” and “I would rather be the last to leave”; there is a variation in the form but not in the transmitted information. Things are

different when it comes to the scientific discourse, in which there is a strong restriction in the words co-occurrence. In biochemistry we can say "the polypeptides were washed in hydrochloric acid", but "the hydrochloric acid was washed in polypeptides", although grammatically accurate, would be an implausible statement. With the analysis of the co-occurrence of the words in the scientific discourse, it becomes possible to define fields of sublanguages separated from the utilized language. According to the authors:

By examining the structure of the biochemistry sublanguages in French and English – that is, the subgroups of nouns, verbs and other elements of the sentences formed by them – we verify that they are identical. By identifying the several subgroups of words of the sublanguage in English with letters – for instance, P for polypeptides and other molecules that may be treated by means of washing, W for certain laboratory operations, and S for certain solutions -, we could represent kinds of sentences by sequences of those symbol-words. Such sentence would be "PWS". It is possible to demonstrate that the same class of symbols and sequences of symbol sentences are sufficient to characterize the classes of words and the kinds of sentences of the biochemistry sublanguage in French. This means that articles in any language, in a given field of the biochemistry, could be represented by sequences of the same kind of formula (Harris and Mattick, 1988, p. 76).

From the perspective of the logic and the linguistics, they are searching for a possible grammar of science, which is certainly complex. However, for our discussion, the important is that the reasoning presented to justify the existence of sublanguages in the sciences reveals a lot of its discursive nature. By settling the sentences in established positions we can represent the information, released from the non-informational aspects of the language. This process of reduction, which Barthes regards as "transparent" and "neutral", is only possible when the information is the central interest in the transmission. The discourse must get rid of its external characteristics to express such information as faithfully as possible.

The social sciences are much too tied to the contexts; that is why the universalization of their discourses is so difficult. The criticism of Jean Claude Passeron (1995) to the scientific idealism of the kind imagined by Popper is suggestive and helps in the directing of the discussion. The author points out that the sociological investigation proceeds by theoretical pathways that are always resumed, since they are never definitively separated from the "literality" of the enunciations that confer them a meaning. Therefore, it is not possible to start from a general theory, from an abstract series of concepts, and become able to deduce what would be found in reality. That is why the comparative method – the ability of establishing relationships - is crucial; the social scientist does not count on a laboratory to make experiments; the very concept of experiment, as it is made in the natural sciences, is unknown to him. The pathway of abstraction demands, therefore, a constant comparative or relational effort. Furthermore, the subject of the social sciences is in a permanent mutation; it is also historical. In this sense, the sociological practice is always a stenography, or a tachygraphy, as Octávio Ianni (1997) prefers to name it. This is a suggestive picture. Tachygraphy and stenography are abbreviated languages; of the richness of the language, they retain no more than a couple of traits. The tachygraphic notations contain a degree of abstraction that is not contained in the amplitude of the language; by being simpler, they gain in universalization. However, such universalization is never complete, emancipated, for the notations are tied to the "literality of the enunciations". The sociological thought is always a translation, something that intermediates the ideal of universality (which is necessary) and the rooting of the social phenomena. Well, context and language are mutually inflected. The discourse of the sciences of nature is justifiable because it attains to reduce the language, cleanse it from its sociocultural mesh, something that is unthinkable when we wish to understand society. In this case, English cannot

operate as an international language, not for a matter of principles, or of national pride, but due to the very nature of the constructed knowledge.

Several hindrances may be pointed out. The issue of translation, for instance.¹² The transition from one language to another, far from being immediate, as if both of them belonged to a same sublanguage, is necessary (the thought and the works must circulate, this is imperative for all sorts of knowledge), but very hard. An additional effort of interpretation is always required, for there is no such thing as a literal translation. Terms, concepts and abstractions must search for their equivalents when subjected to a transition from one code to another. The language reinforces the discursive bond to the soil where the social sciences are developed. But it is not just about a direct translation; there are different traditions, and, often, translating them from one language to another does not mean merely finding the adequate word, but considering a whole expressive constellation. When we say, for example, "questão nacional" or "cuestion nacional", the sentence could hardly be reduced to "nationalism". "Questão nacional" implies a background where a whole intellectual discussion is in progress in Latin America, from the late nineteenth to the late twentieth century, including thinkers, artists and politicians. It regards the issue of national identity, the construction of the nation and modernity; it comprises the criticism to the import of ideas, the inferiority complex of the colonized countries, as well as the quandaries of the peripheral modernity. "Nacionalismo" is one of the aspects of a much wider set of problems. "Questão nacional", or "cuestión nacional", also concerns to a whole bibliographic tradition, from Vasconcelos in Mexico to Gilberto Freyre in Brazil, from the development of CEPAL (*Comisión Económica para América Latina = ECLA – Economic Commission for Latin America*) to the theory of dependence. Even the equivalence of the French expression - "question nationale" – is dubious, for we are talking about constellations of distinct meanings. As a matter of fact, even in the literature written in Portugal (the term refers to the decolonization in Africa) or in Spain (concerning the discussion about the Iberianism), the meaning is totally different. "Questão nacional", or "cuestión nacional", are tachygraphic expressions associated to the history of the Latin-American, peripheral, countries, which are in quest for their identities.

Barthes used to say that, for the literature, the language was its very being, and that it consisted and was concentrated in the act of writing. We could not, certainly, say that the language is the "being" of the social sciences; there are techniques of research, methodologies, theories, or, in one word, obligations that keep it away from the literature. But writing is a common element to these two traditions. The social scientists are right when they insist in the importance of the methodological rules for understanding society, but they sometimes forget to acknowledge the fact of those rules being materialized in a text. Writing is the support and concretization of the conceptual aspect. The same information, the same data, can be put together in different ways by different authors. There is no subject out of its text; in order to exist, its content must be formalized. A great portion of the argumentative exposition is a matter of composition. The primary information is previously evaluated and filtered, before appearing on the blank page or on the computer screen. The composition is crucial for the intellectual activity. In this sense, the construction of the sociological subject occurs by means of the language; therefore, the utilization of a given language is not a casual choice, a mere subtlety of style, but a decisive issue in the final formulation. I will take an example from my own investigation, when, some time ago, I suggested a conceptual distinction between "mundialization" (from the French "mondialisation") and "globalization". When talking about economics and technology, we make reference to processes that are reproduced in the same fashion in the whole world. There is one single global economics, the capitalism, and a single technical system (computers, Internet, satellites, etc.). Thus, "global" brings to our mind the idea of unicity. However, it would be inappropriate to sustain this same concept when it comes to the sphere of culture. There is no global culture; only a process of culture mundialization, which is expressed on two levels: a) articulated to the economic and technological changes of the globalization; its material base is the world modernity; b) a space for different conceptions of the

world, in which distinct and conflicting forms of understanding live together. That is why I would rather say that English is a mondial and not a global language, for, by stating so, I am preserving the differences between the diversities of the cultural sphere in face of the unicity of the economic and technological domains. Its mundiality occurs within a transglossic universe inhabited by other languages. The reader may accept my proposition or not, may regard it as relevant or insufficient, but I only could develop it because the Portuguese language possesses two distinct terms – “mundialização” and “globalização” –, which could be invested of differentiated contents. If I had originally written my theory in English, I would have had to content myself with *globalization*, *global culture*, *global language*. And, for explaining it in English at this moment, I had to use an English neologism – “mundialization” – borrowed from the French “mondialisation”.

The contrast between the social and natural sciences can be discussed further. Several studies show that, in the sciences of nature, the magazines are regarded as “primary” documents, vehicles of the “first hand information”.¹³ The magazine is the par excellence medium of the ongoing science; it is situated on the border, in the gap that is established between what is already known and what is about to be known. The investigators and the laboratory teams privilege it in contraposition to the book, which is regarded as an informative manual, a secondary support in the development of new theories and findings. Thus, the publications tend to value the recent results, which provide dividends to the whole of the area; hence the insistence of many magazines, especially those with a better status in the worldly ranking, in demanding articles whose results have not been published yet. The pressure of time is such that many groups of scientists, especially the physicists, resort to another strategy: the pre-edition. As soon as an article is finished, the investigator, or the group of investigators, submits it to the approval of some magazine and, simultaneously, publishes it in their institution, distributing it by e-mail. Information and time are, therefore, crucial elements that favor the use of the English language. People need to express themselves in a more comprehensive way, in the shortest time possible. On the other hand, the book is the support privileged by the social sciences; even the articles are longer, in opposition to the short (sometimes *very* short) texts of the natural sciences. It is not merely about a matter of status (it exists both in the “humanities” and in the “exact sciences ”); here, the concept of information possesses a different relevance. It belongs to a theoretical and explanatory ensemble, and, often, this interpretative framework is more important than the data that are being transmitted (which does not mean that the information is irrelevant). The social sciences are more interpretative than informative; they require a period of time for reflection and analysis. In consequence, there is no urgency to publish the research results right away, and if, by chance, they happen to be disclosed in another language, it is necessary to wait until their translation. The rhythm of this process is felt even in the kind of material used and valued by the social scientist. In the sciences of nature, the race to expand the boundaries of knowledge causes the certainties of the past to be quickly turned obsolete by the new findings. Thus, the recent, current, information possesses an irreplaceable value. In the social sciences, the validity of the materials utilized in the investigations sometimes recedes to centuries ago, when it comes, for instance, to the reading of the classics. Some studies on the practice of the social scientists with regard to the utilization of the bibliographic data show that, everywhere, both the materials of reference and the citations cover quite extended periods – which means that, in this sphere of knowledge, texts and information are very slow in getting old.¹⁴

Nevertheless, in spite of those remarkable differences, the presence and supremacy of English cannot be denied. A study on the relationship between the languages and the disciplinary areas, performed between 1981 and 1985, with the *International Bibliography of the Social Sciences* database, compiled by the International Committee for Social Science Information and Documentation, presented the following results: in anthropology - English, 55.5%; French, 14.4%; Spanish, 7.7%; Russian, 7.2%; German, 6.3% -; in political science - English, 50.1%; French, 16.5%; German, 7.9%; Russian, 7%; Spanish, 6.3% -; in sociology - English, 49.7%; French, 17.6%; German, 7.5%; Russian, 6.1%; Spanish, 5% -; and in economics - English, 55%; French,

13%; German, 7.5%; Russian, 6.1%; Spanish 5% (Kishida and Matsui, 1997). Certainly, the predominance of a language strongly depends on how the databases are put together. Another work, of 1991, comparing two databases, one of UNESCO (*World List of Social Science Periodicals*), and the other the *Social Sciences Citation Index* (SSCI), provides interesting information. In the UNESCO database, 64% of the compiled magazines belong to the group of countries with a high income, 22% to the group with a median income (it includes the majority of the Latin-American countries), and 14% to the group with a low income. In the SSCI, the low income countries are represented with only 0.7% of their magazines, the median income ones with 2.3%, and the high income ones with 97%. With the exception of the United States, there is a significant decrease in the number of magazines of the other countries: Brazil (from 81 in the UNESCO database to 3 in the SSCI); France (from 295 to 23); Germany (from 217 to 51); Mexico (from 47 to 2). The presence of the English language in the UNESCO database, counting only the United States and Great Britain, represents 32% of the total sample; in the SSCI, this figure is increased to 79% (Narvaez-Berthelemot and Russel, 2001). Trouble is that the databases do not store information only; they are also artifacts of prestige. Some of them have more legitimacy than others. This is the bottom line. English, in its quantitative presence, is creeping in, little by little, as a qualitative hegemony. This is even clearer when the difference between the frequency of the texts published in English and the quotations of the works written in English is analyzed. Based on the SSCI source, between 1990 and 1992, Glänzel (1996) discriminated the publications in accordance with their country of origin, distinguishing, as well, the national and the international articles (collaboration of at least two investigators from different countries). The result is expressive. France, sub-represented in the initial sampling, appears with 2.9% in national articles and 9.4% in international ones, but its rate of quotations is expressed by a mere 0.8%. Therefore, a dramatic decrease occurs in the total of published articles. The United States, with 56.9% of texts in domestic magazines and 6% in international ones (a figure lower than that of France), see their representation strongly valued, for their rate in quotations increases to 76%. On the other hand, Great Britain, Australia and Canada, countries whose majoritarian language is English, keep a balance between the ensemble of published texts and the references. Those same results are confirmed when some North-American and British magazines are analyzed: *American Sociological Review* (98.6%), *Sociology* (98.8%), *The Sociological Review* (99.3%), *British Journal of Sociology* (99.5%) and *Theory Culture and Society* (89.6%) (cf. Yitzhaki, 1998).

If English does not act as an international language in the social sciences, what would the meaning and implication of its dominating presence be? My feeling is that, due to its comprehensiveness, this language has acquired the ability of "enrolling" the discussion in a global scale. In journalism, "to enroll" means to select, among many, some existing problems, making them relevant and noticeable. This kind of procedure favors the existence of a hegemonic set of mundialized representations, which start to be accepted as valid, naturalizing methodological procedures and several sets of problems. The "cultural studies", or the "multiculturalism", for instance, cease to be analyzed with regard to the context in which they were conceived, and in which they make sense, and impose themselves as "universal". Bourdieu and Wacquant, in the text "On the cunning of imperialist reason" (1999), oppose such perspective.¹⁵ Despite the article's central argument being, in my opinion, mistaken – since the authors resume, without a critical view, the concept of imperialism, and demonstrate a strait understanding of the process of globalization (for them, it is a synonym of Americanization) --, what is under discussion is precisely the issue of the "false universalization". In other words, the issue of how certain ideas and world-views are disseminated and legitimated among the different societies without a previous critical reflection about them. This is only possible because, in the discussion about the globalization, there is a trend to regard it as equivalent to universalization. What makes this equivalence believable is the concept of territoriality. By expanding their boundaries, by deterritorializing themselves, the universal and the global would participate in a same movement, transcending the local differences. Thus, when some

sociologists discuss the relationship universalism *versus* particularism – I recall Robert Robertson --, the term “global” appears as an attribute intrinsic to the universalism, and what is left to the particularism is a reduced expression, territorially located.

There is no doubt that the social sciences have been changing with the process of globalization. The alterations in the social relations require a new vision and the definition of new categories of thought. Certainly, when focusing on the world as a theme for reflection, the scholar is released from the space circumscribed by the territoriality of the regions or of the nation-state. But it would be a mistake to imagine that the sociological analyses have, currently, become “more universal” than those of the past. The statute of the sociological explanation, as Passeron qualified it, remains unchanged. The economists also insist in saying that the global capitalism contributes for the universalization of the spirits; in its turn, the literature, which occupies itself with marketing and business, does not hesitate in stating that the individuals consume global products because they meet their universal wishes. Such undue approaching between global and universal derives from the recurrent utilization of the spatial metaphor. That is, all this would be no more than an expansion of the spatial limits. However, “universal” is a philosophical category, and “global” is a sociological one. The first one means transcendence, and expresses an abstract relationship that does not, necessarily, materialize in an immediate form – that is what allows the illuminists to use the expression “human race”. By saying global market, global sociology, global economics, we identify things and processes that develop on the plane of the real history of mankind. Thus, by approximating so distinct concepts, we would be suggesting that the universal materializes in the global, which is obviously false. The English language participates in this collective illusion, and, once more, the comparison with the sciences of nature is quite elucidative. The possibility of English becoming an international language derives, as well, from the fact that the natural sciences are paradigmatic, in the sense provided by Khun. They presuppose a sole system of reference, in relation to which the scientific practices are organized. Characteristics like these – communality and comprehensiveness – allow us to associate them to the idea of universality; their laws, findings and explanations are equally valid. However, the social sciences are not paradigmatic in this sense. As a last resource, if focusing on the context, we should say that the ideal would be the knowledge of all languages in which the social sciences are expressed, in order to obtain, not a universalization of the spirit, but a library of languages at the service of a greater richness of thought. Although it is an unachievable feat, it is important to keep it in mind, for the cosmopolitanism of the ideas can only exist when we take into consideration the diversity of the concepts and the “accents” of the sociological traditions. Nevertheless, what is observed is a movement in the opposite direction of any kind of diversity of the interpretations. The worldwide market of translations provides us with a good picture of this fact. In the United States and the United Kingdom, less than 5% of the published works are translations (including literary works); in France and Germany, this figure is approximately of 12%, while in Spain and Italy it goes as far as 20% (cf. Heilbron, 1999). This means that, the most central is a language in the world market of linguistic assets, lower is the rate of translated texts in the corresponding countries. The corollary of this axiom is that the translations between peripheral languages become rarer and rarer, for they should necessarily pass through the mondial vernacular. As a matter of fact, when observing the expansion of the databases, the constitution of information bases, the publishing of books and articles, the increase in the quotations of works written in English, and with the coming of the on line magazines, all of this preferably inflected in the English language, we get the false feeling that such comprehensiveness is a synonym of universality. Being published and quoted in English would not be, therefore, the result of the expansion of a circuit, of its territorial amplification, but the primary condition of thought (hence the Anglo-American authors adapting so well to the monolingualism: after all, little scientific relevance would exist). Writing in another language would also cease to mean a circumscription to a given form of expression, a condition that is perceived as a limitation. This gets even clearer when certain judgments are extrapolated from the area of the sciences of the nature to

that of the social sciences. The strategy of elite groups in the areas of physics, chemistry and biology, in countries with non-English languages, of writing and publishing in English, implies the idea that there is a hierarchic unevenness between the local and the universal. Hence the tendency in stating that the magazines published in a national language are focused on local aspects, whose importance for the development of the scientific knowledge would be smaller. The validity of such theory may be discussed, but it is based on the existence of paradigms accepted by the international scientific community. In the case of the social sciences it does not occur, but, even so, the parallelism is implicitly accepted. The global English becomes the universal English. Thus, we have not only a hierarchy among the languages, marking the dissimilarity existing between them, but also the establishment of a subtle factor of intellectual segregation. The homology postulated between local-global / particular-universal closes the circle, lowering the other interpretations to the subordinate status of localisms. It is conveniently forgotten that the cosmopolitanism is not a necessary attribute of the globalism, and that the particularism of the thought is formulated both in a dialect and in the global language, for in the condition of the world modernity it is plausible, and commonplace, to be globally provincial.

NOTES

1 Fishman, Cooper and Conrad (1977), Bailey and Görlach (1982), Cooper (1982) and Greenbaum (1985).

2 Among others, I quote McArthur (1987).

3 I suggest to the reader the classic text by Ballandier (1951), in which the author, when criticizing the culturalist perspective, coins the concept of "colonial situation".

4 There are exceptions that confirm the rule, such as the article by Swaan (1991).

5 I resume the argumentation developed in my book *Globalization and culture* (1994).

6 As the title of the article by Fishman (1982), "English as an additional language", suggests.

7 A perspective similar to this was discussed by Calvet (1999).

8 The number of those languages is controversial. Calvet does not agree with the position attributed by Swaan to the Japanese and German languages; in his view, they would be languages spoken by a great number of speakers, yet concentrated in the same geographic space.

9 See the data in Baldauf Jr. (2001).

10 See the data in Gómes, Sancho, Moreno and Fernández (1999).

11 See, among others, Alberch (1996).

12 Swaan (2001b) emphasizes this aspect.

13 See, among others, Josette de la Veja (2000).

14 See, among others, Stone (1982) and Romanos de Tiratel (2000).

15 For an interesting criticism to the authors' point of view, see Friedman (2000).

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