

Academic Knowledges in Ethnographies of Indisciplinable Local Knowledges: ethno-mathematics and other ethno-x*

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Abstract

The article proposes a critical debate about the prejudiced separation between the knowledge of the academy or instituted science and the local knowledge of populations from different cultures and social organizations far from the surrounding society. From the ethnography of knowledge, the registered field material must be analyzed, already in the academy, by interdisciplinary interaction of researchers from different disciplinary areas. In the field, some private researcher focuses on certain areas of knowledge that interest him when practicing ethnography without, however, projecting his disciplinary field on his interlocutor. Of interest in everything associated with mathematics, for example, only after returning from the field would it make sense to use as a technique, a method of analysis proper to some ethno-x, where x is one of the academic disciplines that in this author's particular understanding could, for example, be mathematics.

Keywords: Ethnography of Knowledge, Ethnoscience, Ethnomathematics, Fundamental Education, Anthropology

Saberes Acadêmicos nas Etnografias de Saberes Locais Indisciplináveis: etno-matemática e outras etno-x

Resumo

O artigo propõe um debate crítico sobre a separação preconceituosa entre os saberes da academia ou ciência instituída e os saberes locais de populações de diferentes culturas e organizações sociais distantes da sociedade envolvente. A partir da etnografia dos saberes o material registrado deve ser analisado, já na academia, por interação interdisciplinar de pesquisadores de diversas áreas disciplinares. No campo algum pesquisador particular focaliza a partir de certos domínios do conhecimento que lhe interessam ao praticar a etnografia sem, no entanto, projetar seu interesse disciplinar no seu interlocutor. Do interesse por tudo que se associe à matemática, por exemplo, só após a volta do campo faria sentido usar como técnica, um método de análise próprio de alguma etno-

Submetido em: 26/06/2021 **Aceito em:** 18/08/2021 **Publicado em:** 03/09/2021

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x, onde x é uma das disciplinas da academia que no entender particular desse autor poderia, por exemplo, ser a matemática.

Palavras-chave: Etnografia de saberes, Etnociência, Etnomatemática, Educação fundamental, Antropologia

Conocimientos académicos en las etnografías de conocimientos locales indisciplinables: etno-matemáticas y otras etno-x

Resumen

El artículo propone un debate crítico sobre la separación prejuiciada entre el conocimiento de la academia o ciencia instituida y el conocimiento local de poblaciones de diferentes culturas y organizaciones sociales alejadas de la sociedad circundante. A partir de la etnografía del conocimiento, el material registrado debe ser analizado, ya en la academia, a través de la interacción interdisciplinaria de investigadores de diferentes áreas disciplinares. En el campo, algún investigador particular se enfoca en ciertos dominios del conocimiento que le interesan a la hora de practicar la etnografía sin, sin embargo, proyectar su interés disciplinar en su interlocutor. De interés en todo lo relacionado con las matemáticas, por ejemplo, solo después de regresar del campo tendría sentido utilizar como técnica, un método de análisis específico de alguna etno-x, donde x es una de las disciplinas académicas que, en la particular comprensión de este autor, podría ser, por ejemplo, matemática.

Palabras clave: Etnografía del conocimiento, Etnociencia, Etnomatemática, Educación fundamental, Antropología

1. Introduction: science, ethnography of knowledges, ethnoscience and the etno-x

From the moment we start to deal in this manner [by the anthropology of the science] the terms of the scientific folklore, the vertiginous distance that separated until then the literature about beliefs and the literature about science started to reduce quickly. It was soon noticed that the Great Divide was not a natural boundary, not even a conventional limit and, even less, an imaginary line such as the ones of the tropics. (Bruno Latour, 1983)².

The purpose of an ethnography [ethn (o) - + (graphy)] of knowledges, of other cultures or of academic groups is to understand and registrate the ways in which the knowledges of an ethnic group³ in tandem with its techniques and practices are constructed by relating themselves to their natural and social surroundings.

² Bruno Latour “How to redistribute the Great Divide” between the scientific and pre-scientific spirit similarly to that one between modern western societies and the ones of different cultures. [*Comment redistribuer le Grand Partage*, 1983].

³ Ethnic group, from the Greek word *ethnos* is related to people, nation and it comprises a group of people that commune with a certain number of material, intellectual and spiritual characters typical of characteristic of a society and imparted by it. (AUTOR and SANZ, 2004, p. 15).

As S&T (Science & Technology) have a huge number of areas and specialists of knowledge, traditional societies stand fewer specialists, but they have a simultaneous engagement with the natural, social and spiritual realms. As the academy constitutes itself in having a sole and universal science, without ‘sociocultural diversity’ – according to Bruno Latour (1983, p.172)– it will be necessary to “initially introduce a little of symmetry in the analysis” of different ways of knowing in the academy inward.

Searching for more symmetry between knowledges, scientific techniques and practices and those derisively said to be ‘pre-scientific’, Giorgio Cardona introduces, in *La Foresta di Piume: Manuale di Etnoscienza* (1985), an idea of what would be science with more symmetry between different kinds of knowledges:

As it stands to reason that all forms of classification the man conceived to give an order and to name what he sees in the surroundings are substantially equivalent, all of them are substantially scientific even if just by the obvious sense that the noun *scientia* derives from *scio*, ‘I know’ and, therefore, any organization of our knowledge is a *scientia*; each one answers to a fundamental human necessity, to find himself, to measure himself, to know himself, to systematize measuring, knowing, ordering what is in his surroundings, similar or different to him”. (CARDONA, 1985, p. 10. Free translation).

From that *scientia*, ethnoscience is considered here an ethnography of knowledges, techniques and practices about the subjects of the ‘other’ science ethnographed at fieldwork. This material, back at the academy, is analyzed by ethnoscience, i.e., methodologically it is an ethnography of science of the other constructed from and in the disciplinary referential of the academy (CAMPOS, 2002).

As an example, a scientist practices ethnoastronomy when coming back from the field and working on knowledges and practices from there about the sky, the dynamics of sky-earth relations, their times and temporalities contained in the local social organization. This approach of the field material at the academy is interdisciplinary, at least by way of anthropology, astronomy and ethnoastronomy.

Many indigenous societies have a necessity of marking the seasonal times in a precise way and regardless of human actions, verifying if temporalities proper of the territory come up to the expectations. The non-dependence on human actions is granted by the observation of the celestial time markers. This author, in his surveys among the Kayapó (people) from Aldeia Gorotire (State of Pará, Brazil), observed correlations between recognized constellations rising in the horizon shortly before the sunrise and the proper seasonal time markers of other natural and social events of the territory of that village.

In those months, the river water level starts to lower, the *kubyt* (brown howler monkey – gender *Alouatta*) starts to lose weight and to ‘sing’. The last crops of potato, cassava and banana take place and the leisure, the social interaction at the beaches and in the villages start to become more intense with great dedication to body paintings. It is in the end of this period that the preparations to the *puru metoro* (Festival of the fields) start.

With the beginning of August, the river is already low (*ngô ngrà*) with large beaches (*pyka ti ngrà*) and islands (*apêtê*). The monkey’s comb flower, the fruit of banana or helicônia (*tyryti djô*), the royal hawk chant (*kàikwa kam àk*), the drilling of the fields and the intensification of the fishing that results in the use of the timbó (*akrôre*) come along. (CAMPOS, 2006, p. 70; CAMPOS 1987 in HAMU, 1987, p. 44-48)

All this involves, as it is noticed, the interdisciplinary analysis necessary (CAMPOS, 2002, p. 56-62) in the academic handling of the data brought from the field.

Besides the anthropologists, in such kind of research, the specialties in the circuit field-academy are diversified. As each one has a specialty ‘x’ these will work on the field material focusing on methods according to their ethno-x, where –x is corresponding to an area of academic knowledge. There, any area of knowledge is included such as ethnomathematics, ethnoastronomy, ethnobiology, ethnoecology, ethnopedology. These and other academic disciplines, with or without the prefix ethno-, are associated with the same type of analysis by the anthropology of knowledge as well as specialists like shaman, healer, herbalist, fisherman, mason, tire repairman and others that are studied. (See Image 2). Thus, working on symmetrical analysis without prejudice of different knowledges, whatever they are, is sought.

It is emphasized that the spellings of ethno-x are opposite to the official orthography because here it was purposely sought to conserve ethnosciences as area of knowledge and ethno-x as methodological techniques. These techniques from disciplinary origins developed in the state of ‘being here’ at the academy to the analysis of the material brought from ‘being there’ at the field.

The ethnosciences practiced in Brazil has been important in the ethnographies of the knowledge between the fieldwork and the academy. However, prejudices connected to their origins in the USA persist, emphasizing excessively in systematics and taxonomy. Even among Brazilian anthropologists there is a derogatory association between *etnociência* (Portuguese) and the English term *ethnoscience* (CAMPOS, 2002, p. 56-74).

Overcoming difficulties, nowadays in Brazil the dynamics of the relations humans/nature are the focus. Those relations include approaches ~~and~~ that also involve political activities contrary to racial and ethnic prejudices as well as to oppressions against traditional and indigenous⁴ groups.

⁴ An example is the Kayapó Project, in the Aldeia Gorotire (State of Pará - Brazil), developed from the Emílio Goeldi Museum (MPEG) in Pará in the 1980s with approximately twenty researchers. The Project was coordinated by the late Darrell Addison Posey (biologist and anthropologist). This author worked markedly on knowledges of sky-earth relations. See Denise Hamu (1987).

2. Natural and Social Sciences in the encounter with the other: double and triple liminality

Researchers at the academy and in the field face epistemological obstacles in the contexts and realms of knowledge that challenge them (BACHELARD, 1996). At the academy, interdisciplinarity is already a challenge by the epistemologies proper to each area of knowledge, in the testing and rewarding dialogue between different cosmovisions. In some of the social sciences, researchers make use of the ethnography that, beyond its theoretical framework, in the field is literally the practice of writing about people and social groups in which they interact. Roberto Cardoso de Oliveira (1996) considers the work of the ethnographer composed of three strategic movements: looking, listening, and writing. Certainly, it is accompanied by artifacts to carry out these three movements. These ones imply a comes and goes circulation between the field and the academy in the search for interdisciplinary enlightenments. This circulation is well defined by Clifford Geertz (1989) through countless alternations between ‘being there’ (in the field), ‘being here’ (at the academy) and ‘writing here’ (at the academy).

In ethnographic research between local groups with remarkable differences with the surrounding society, an intense effort of openness to the dialogue is imposed. As the worldviews and cosmovisions can be very different between each one of the ways of living in dialogue, the path to the interlocution takes place with the facilitation of the communication from each interlocutor in its sociocultural referential, its point of view. In order to the relation to be marked by dialogicity’ – the essence of education as a practice of freedom, as Paulo Freire discusses in the chapter three of *Pedagogia do Oprimido* (1981), (*Pedagogy of the Oppressed*, 1968), - It is necessary to make an adjustment to ok the individual reference frames to the dialogue, that is, from what place, birthplace, nationality, culture, point of view each one expresses themselves. For instance, in our first talk with a Hindu it is necessary that we set off from the fact that a wag of the head almost in the horizontal direction in India expresses a categorical and satisfied yes, and exactly the opposite for us.

The dialogues between different areas of knowledge are not always easy tasks to undertake at the academy. There are difficulties between natural sciences and social sciences and also terrific efforts to the adjustment of dialogue references. In the ethnographic work, proper local knowledges and very different knowledges between local and academic cosmovisions prevail, what complexifies the situations. Understanding this problem, the anthropologist Edmund Leach and his artifact of the set theory is called on.

Edmund Leach (1978, p. 43-46) used diagrams of Venn-Euler from set theory to discuss ‘The Symbolic Ordering of a Man-Made World: Boundaries of Social Space and Time’. Leach mentions boundaries or limits as ‘no man’s land’ - without dimension. With that ‘the principle that

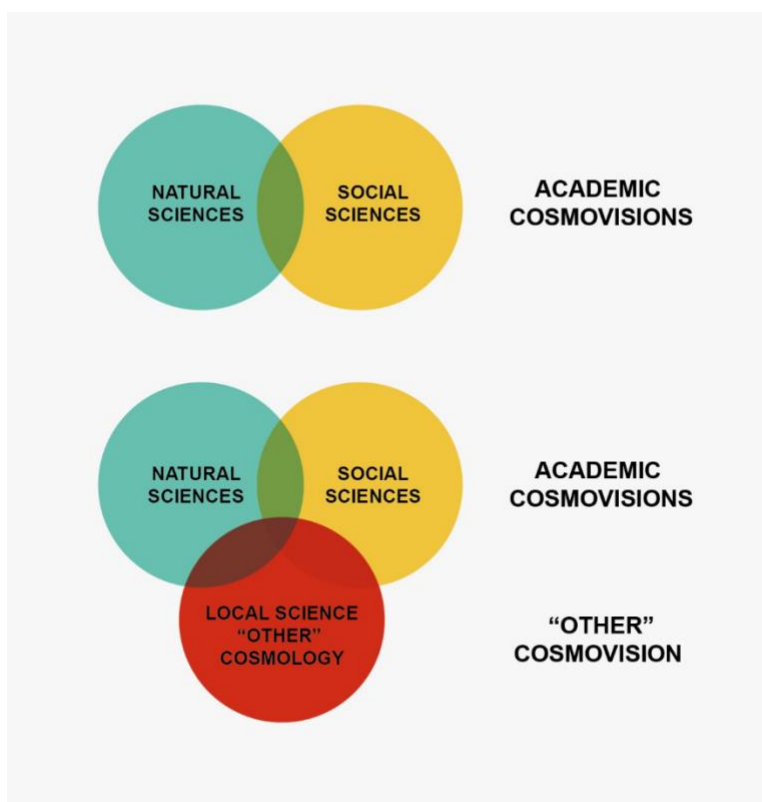
all limits are artificial interruptions of what is naturally continuous and of that implicit ambiguity in the limit is itself a source of anxiety, it is applied to time and space'. (LEACH, 1978, p. 44), especially when related to social aspects.

In the wedding ceremony, for example, conceptually, a change of status from 'single to married' is simply an exchange of categories, an exchange of a social status to another one. It transpires that in the action level, the exchange needs a ritual, a crossing of social boundaries that takes place in 'nobody's time' which rightly corresponds to the intersection between temporal categories. The boundary or the undefinable limits, represented in the intersection, take special importance and value: ritual, 'sacred', 'taboo' a moment of transition or uncertainty between two known states – ritual moment. In conclusion, the intersection in the diagram of Venn-Euler is a liminality zone bound to taboo. Here it was referred just to temporal limits, but without great details, the case of spatial boundaries has a good example by thinking about this imaginary line that divides the space between countries. A liminality takes place if someone steps on a border line in such a way that heel and ankles of the same foot are located in different countries.

To interact with and to understand the knowledges of other cultures we cannot cling ourselves to the disciplinary tethers as interlocutors willing to interact and observe these populations. Between the technoscientific society and an indigenous society more isolated, for example, there is no 'disciplinary' isomorphism between the respective specialties. They are different cosmovisions - that already take place at the academy – on one hand, between the almost insurmountable boundaries between natural and social sciences or intersection of double liminality (Image 1a). If the natural and social scientists interact in the field with other culture, now, the liminality becomes triple between the academy and other cosmovision (Imagine 1b). For that reason, the caution (is important) in order that disciplinary tools in the field are not made explicit creating conflicts with the local knowledges themselves in which we want to know.

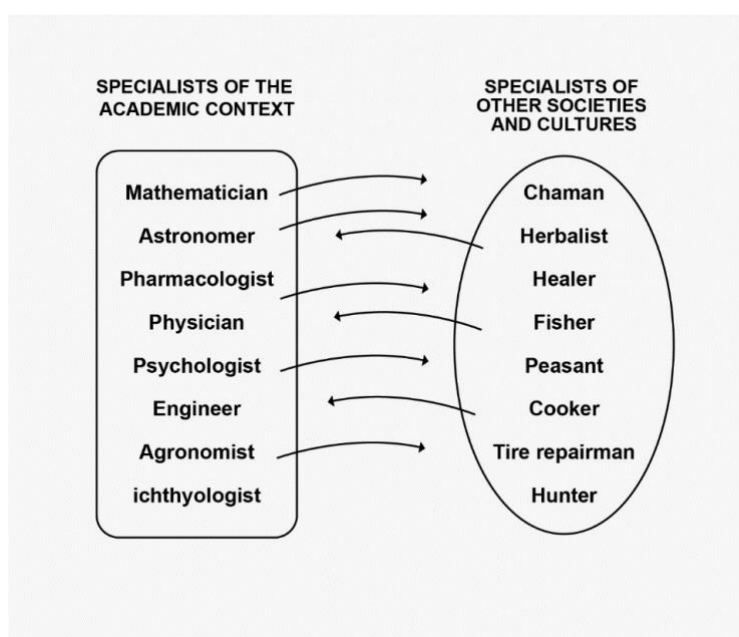
In the case of the triple intersection of liminality, being almost impossible to exist isomorphism between the specialties of the academic and researched realms, the researchers of the academy are usually required to articulate themselves in an interdisciplinary way (CAMPOS, 2002, p. 56-62) to understand better the knowledges and techniques of the other sociocultural context. About the difficulty or impossibility of finding isomorphism between specialists of the academic environment and of the other socioculture, the Image 2 schematizes the problem.

Image 1 - 1a Intersection zone of double liminality between natural and social sciences at the academy. 1b. Zone of triple liminality in the fieldwork with other society and with other culture.



Source: Self-elaboration.

Image 2 - Difficult isomorphism between the academic specialties and the ones of societies and cultures different from the technoscientific surrounding society.



Source: Self-elaboration.

Because of certain convenience of writing, and keeping the caveats, throughout the text are used some terms such as ‘other’, ‘other knowledge’, ‘other culture’ to distinguish the characteristics of the surrounding society immersed in S&T and that is why sometimes it is denominated scientific tradition - despite of the fact that this term puts a great amount of excluded aside. This caveat still justifies itself more by the fact that from the beginning of 1980s the number of people that are part of the said ‘native’, ‘traditional’, ‘quilombola’ and specially ‘indigenous populations’ was intensified, having access to universities and inaugurated a generation of ‘native anthropologists’ that although, being scholars now, they keep referring themselves and defending the preservation of the differences in the dynamic proper to their places of origin. Differences and the respect to them, persist, and absolutely have nothing to do to a continuum between customs and knowledges of local and global societies. Clearly, in many contexts of intercultural encounters - whether they be dialogic, tense or oppressive -, this new reality started to complicate and relativize the use of the antinomy ‘us’ and ‘them’ or ‘us’ and the ‘others’. The thought, because it is individual, it is always unique as a process, even though it socially leads to a great diversity of sociocultural products with their own systems of expression - a discontinuous spectrum of different and differentiable knowledges, each one of them being a *scientia* as Cardona (1985, p. 10) indicates.

Clifford Geertz (1999) reflects critically on the idea of the ‘other’, adding important aspects about what was above-mentioned in the paragraph:

... thought is multiple as product [sociocultural diversity] and singular as process, what constituted itself as important paradox in the social sciences creating theories in all directions, some of them reasonable, but the nature of the paradox has been seen as related with a **translation puzzle, that is, the one as how one meaning in a system of expression is expressed in another...** - cultural hermeneutics, not conceptive mechanics.

(...) **We all are native now**, and any other person that is not immediately one of us is an exotic. What before seemed to be the question whether savages could distinguish between fact and fantasy, now it seems to be the question of knowing **how others, from overseas or in the corridor, organize their meaningful world.** (p. 226), [emphasis added].

Being “all native now” open ways to the ethnography of complex societies in the organization of meanings in contexts that were not thought before, as those from the social institution of science (S) and of technology (T) itself that was consecrated in the binomial S&T. Being this the one upon which some intend to attribute “scientific neutrality”, a rumor that never existed and that breaks down - among other reasons - with the advent of, according to Latour, the ethnography of laboratories. It is done in a similar manner to the way it is processed, articulating emotion and reason, the ethnography in indigenous villages. Thus, Laboratory Life was ethnographed in the objective and subjective

context of the ‘production of scientific facts’ in the Neuroendocrinology Laboratory of the Salk Institute in California (LATOURE; WOOLGAR, 1997).

3. From social evolutionism to cultural diversity of modern anthropology

It is essential that each component of the sociocultural diversity on the surface of the Earth be recognized, respected and valued.

History and, especially, Anthropology only started to assume sociocultural diversity in the end of the XIX Century. For this reason, here are considerations about the horror of the beliefs in the unilinear social evolutionism that considered the said ‘humanity’ as having only one society and culture. Until today abusive uses of the term ‘humanity’ hide the evidence that people, societies and cultures are different, although originating from the same human species.

Before modern anthropology, there was the belief that human societies obeyed and unilinear evolution characterized ‘historically’ in three stages: savagery, barbarism and civilization. As the intellectuals did not believe in participant observation⁵, both inferior categories were imagined - and not observed - by the ‘civilized’ in a convenient social distance. As evolution was already a conversation subject, they could at least represent in a time axis the evolution of human societies. This would be totally out of consideration and they would not think in cultural diversity, although any form of inequality was tacitly accepted.

In 1851, Charles Darwin proposed the theory of biological evolution from the origin of the species. From 1870, some social scientists proposed the unilinear social evolutionism in a scientific longing for bringing pseudo-certainties of the natural sciences to the humanities and social sciences. Criticism did not delay, and Franz Boas was among the pioneers with his article ‘The Limitations of the Comparative Method of Anthropology’ (1896). His criticism contended the unilinear character in which ‘civilized’ imagined savages and barbarians fated - if they would evolve - to become like those by way of a unique sociocultural ‘path’.

With Franz Boas and the end of the unilinear social evolution, the reconsideration of humans constituted in different societies and different cultures in the great sociocultural diversity of the planet is established. Thus, modern anthropology is established.

⁵ Methodology of the fieldwork in which the ethnographer through observation and participation in the social life of the people and groups under study. It is suggested to read the Ten Commandments about ‘participant observation’ proposed by Licia Valladares (2007). Licia was inspired by William Foote Whyte, a sociologist that dedicated himself to ethnographic research in urban contexts: WHYTE, William Foote. **Sociedade de esquina: a estrutura social de uma área urbana pobre e degradada**. Rio de Janeiro, Jorge Zahar, 2005. [Translation into Portuguese from: ‘Street corner society: the social structure of an Italian slum’, 1943].

The frame of observation, to the comparative prejudiced imaginations was the one of the “civilized society” that auto-classified as such maintained itself looking at the supposed subalterns from a frame supposed to be civilized, unchangeable, stagnant, but always capable of understanding/imagining what happened with the “others”. These, of imposed subalternity, kept themselves perfectly integrated into the key antinomy - “us”/ “others”. Being this, the antinomy of the domination and colonization that, even though, with the decolonization today “inexistent”, ex-colonized still keep - rooted in the individual memory of body and soul just as in the social memory - what is denominated nowadays as coloniality: a veiled reconfiguration of the antinomy “us/others” (LANDER, 2005). From there, the individual and social movements that today fight and reflect on decoloniality⁶ were originated.

It is important to highlight the domination character in both contexts - colonization and coloniality. If intercultural exchanges happened, those are not close to dialogical exchanges in a Freirean meaning. Those exchanges, veiled or not, seem to be more like banking operations (FREIRE, 1981, p. 76).

Therefore, colonization made explicit by colonialist countries that apparently was extinguished in the independence of old colonies, took a contemporary shape of coloniality rooted individually and socially in the present independent nations, just as well as between populations that experience subaltern conditions of life in several regions of the planet. Examples do not lack, and it is enough to mention the refugees’ situation in more ‘developed’ countries as well as the tense relations North/South in USA until today and since the Secession War (1861-1865), just as the contemporary tensions in the boundary Mexico-USA (BAEZ LANDA, 2019).

The remnants of the unilinear social evolutionism exist and represent themselves until today permeated with ethnocentrism, racism and other prejudices. It is heard and it is read, for instance, sentences like ‘the indigenous culture is low’, once pronounced General Leônidas Pires Gonçalves⁷, the minister of the army during José Sarney’s Government.

Prejudices related to supposed inferiorities, but that in fact, dwell in the recognition denial of differences between “white”, black, indigenous, westerners and easterners, etc., make that differences (\neq) be just recognized by pseudo-superiors, not as they should but in fact as inequalities between people, groups and hierarchies proper to institutions. Inequalities that in the mathematical language would be represented by two symbols - greater than ($>$) or less than ($<$) and never by equality ($=$). It is worth mentioning the motto of the French Revolution: Liberty, Equality, Fraternity.

⁶ See ‘Grupo modernidade/colonialidad’ in a Wikipedia’s entry, Available on: https://es.wikipedia.org/wiki/Grupo_modernidad/colonialidad. Accessed on Feb 15, 2021.

⁷ Other aspects of this discussion, including biological anthropology and legal medicine, can be found in “O que é antropologia e etnografia?” (CAMPOS, SANZ, 2004, p. 14-28). [What is anthropology and ethnography?].

For the elites it seems to be ‘easier’ to live together and to take advantage of subaltern services for a convenient social distance integrated with the differences of classes and economic inequalities.

In this manner, now, it goes to the discussion of more convenient ways to know other cultures by the ethnography of different ways of knowing constructed by the diverse ways of reading the world.

4. ‘Scientific’, ‘pre-scientific’ and local knowledges - between symmetries and asymmetries

In the Great Divide between ‘scientific’ and ‘pre-scientific’ knowledges, Bruno Latour (1983a) considers symmetries and asymmetries in critical and ironic comparison between these types of knowledges to think of ‘How to redistribute the Great Divide’⁸ between ‘accredited’ and ‘discredited’ knowledges. This division should be lurking us daily in our recurrent readings of the world.⁹

The ironic criticism over the term ‘pre-scientific’ is evident considering that Latour defends the symmetry as principle of analysis between any different forms of existing knowledges. Here, the ironic ‘pre-scientific’ seems to characterize the knowledge of one previous period to the advent of ‘science’ or the application of the ‘scientific method’. Assuming this view of ‘science’ goes clearly against the interesting symmetrical idea of science (*scientia*) of Giorgio Cardona (1985, p. 10).

In the exercise of anthropology of sciences and techniques, Latour proposes to deny the attribution of any credits to any process or product guided by the Great Divide. Wherever they come from or act upon, the producers of knowledge should submit themselves to the same type of ethnographic investigation whether they are scientists, professors, sorcerers, intellectuals of the backcountries, engineers and botanists.

Instead of introducing since the beginning, as first evidence, the existence of an abyss between the scientific ways of knowing and the others, it was better to arrive at this abyss, if there were, after the research and only after all possibilities of simpler explanations had been all gone. Thus, this division between the sciences and the rest, if it would exist, it would be much better grounded. (LATOUR 1983a, p. 169).

In 1992, in Rio de Janeiro, Eco-92 or the United Nations Conference on Environment and Development (UNCED) took place. During the 90s, the discussion about sustainability, mostly related to consumerism, aggression to nature in urban environments, was intense. Other ways of

⁸ Originally published under the title ‘*Comment redistribuer le Grand Partage?*’ (LATOUR, 1983), it was translated in the same year in Brazil with the title “Como redividir a Grande Divisão” (1983a). Instead of ‘divide’, the term ‘redistribute’ seems to be more faithful to the French original idea.

⁹ See “Leitura da palavra...leitura do mundo” (FREIRE; CAMPOS, 1991).
[Reading the Word...reading the World].

sustainability, such as the sociocultural, was little discussed, as still it is today. By the end of the decade, Jonathan Murdoch and Judy Clark discussed the sustainability of knowledge (MURDOCH; CLARK, 1999). Concerning the critics of the asymmetrical conception of science, they showed that between instituted science and local knowledge there would not be difference but by the fact that this would have a superior access to 'reality' but, yes, by the fact that this is the most powerful and capable of relocating itself to act at a distance.

Murdoch and Clark (1999, p. 119-122) draw attention to the eminently local way of science production and the essential role of the laboratory. This puts the debate 'global/local' in question because while science production is local, its diffusion by social actors is global.

The accomplished feat of the new sociology of science is to make science splendidly transparent by an effect of power. Studies of 'science in action' become the study of science as power practice, insomuch as private centers of knowledge (generally laboratories) act upon other times and other places; soon, the problem becomes the one of how scientists act at distance (p. 121).

We should examine how some actors earn the right to speak for others and show how they impose their own specific definitions and roles about these others. In order to have success an actor must colonize others actors-world (p. 122).

Latour is emphatic when affirms that a result or a scientific fact is, in general, produced in a laboratory and therefore, always created locally. Consider that this fact, still being in the domain of the laboratory, is a 'soft' fact. As soon as it is recognized by the scientific community and later by the population, it arrives with effort to the status of a 'hard' fact.

This implies that, to have success in 'hardening' a fact and strengthening the connections, comes into play the world-of-actors responsible for relocating science and its laboratory facts, to institutionalize it, universalize it. In this way it is necessary that social actors have colonized their world-of-actors, included the key sectors of the scientific community. Clearly, for this task, the financial and energy resources to expend involved in the social institution of S&T are fabulous (LATOUR, 1983a, p. 181).

What to think about other ways of producing science and local techniques proper to traditional societies?

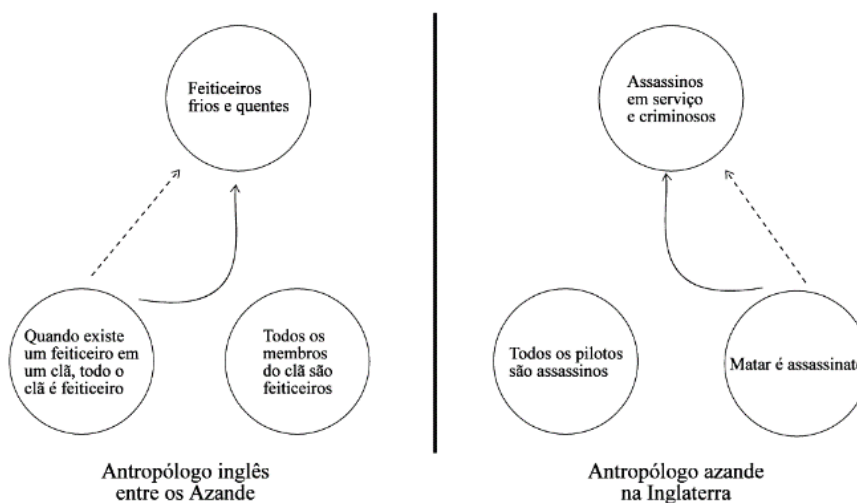
Once the propagation of a fact is carried out, this venture is strengthened by the breadth of 'horizon' or 'wide-angle view' of propagation by space-time compression. What the venture does not allow is inclusion. It is to distinguish the worldwide diversity of traditional populations. When it distinguishes, it escapes using social, cultural and circumstantial explanations about the local knowledge. This takes place only when what the other knows is allegedly recognized as false - even before being known. If it is true, there would not be a necessity of cultural and social explanation: the truth is enough to explain it to itself. (LATOUR, 1983a, p. 172).

Thus, each study brings evidence that the scientific facts are not products of determined cultural circumstances. For that reason, the question that cannot be avoided by reading them comes up: how we, westerners, were capable of inventing a way of knowledge so radically original that it escapes from all cultural conditions of production? The Great Divide exists, Q.E.D. Miracle of the universal reason that escapes from cultural circumstances. It is not a surprise this Q.E.D. It is completely encompassed in the question and absence of symmetry accepted at the beginning between winners and losers of the history of knowledge. (p. 172).

Latour (1983a), by discussing symmetry and its contradictions go through some examples such as the ones of the monograph ‘Witchcraft, Oracles and Magic Among the Azande’ (EVANS-PRITCHARD, 1976, 1978 (in Portuguese)). This monograph clarifies the contradictions in the appeal to ‘social, cultural or circumstantial explanations’ explicit by prejudices against local knowledges - the ‘discredited’ of traditional societies. For this, Latour presents an illustrative scheme in the Image 3 and comments:

The example is already classic (see image 3). According to Evans-Pritchard, a logical conclusion that the Azande people could take (‘once a member of the clan is declared witch, all members of the clan are witches’) is diverted because it clashes with a social prejudice firmly established (everyone knows that the whole clan cannot be witch). The result is a deviance in relation to the logic and a commitment between the social conditions and the logic (‘there are cold witches’ [that do not succeed as witches]). Conclusion of the analyst: the logical skills of the Azande are not absent but they are thwarted by cultural prejudices and they never could develop themselves freely (LATOUR, 1983a, p. 173).

Image 3 - Example of the symmetrical anthropology of Bruno Latour. An English anthropologist among the Azande and an ‘Azande anthropologist’ among the English at each side of the symmetry plan.



Source: (LATOUR, 1983a, p. 173).

Latour (1983a) refers to his colleague David Bloor to apply what he calls ‘principle of symmetry’ through which an imaginary Azande anthropologist studies ‘westerners’ in the same way they use to study them in their village. (BLOOR¹⁰, 2009 apud LATOUR, 1983a, p. 174).

From the record of this imaginary ethnologist, a logical conclusion that westerners could take (‘once every person that kills voluntarily is a murderer, the pilots of bombing runs are murderers’) is diverted because it goes against a social prejudice strongly established (‘everybody knows that the pilots of bombing runs are not murderers’). The result is a deviance in relation to the inference and a commitment between the social conditions and the logic (‘there are innocent murderers’). The conclusion of the Azande analyst: in this culture ‘people do not have a practical interest in logical conclusions and [...] they prefer to maintain their jungle metaphysics, for fear of seeing their repressive institutions threatened’. (LATOUR, 1983a, p.174).

Without deepening Latour’s analyses about the example, few of his commentaries follow. The deviance in relation to a logical inference is in ‘everybody knows well’ what would eliminate the circles near to the plane of symmetry with arguments that although they could seem logical, they have less chance of taking place. These arguments were imposed by that one that even ignoring the culture, comes into contact with it. “The words ‘irrational’, ‘illogical’, ‘magical’ are accusations; they are the effect of the clash between the system of reference, they do not say anything about the logical skills or the ways of reasoning of neither culture in particular’ (LATOUR, 1983a, p. 174).

In this way, we assume from both sides the dotted straight lines, setting aside the curved lines and the two circles near the plane of symmetry whereby these lines ‘attract themselves’.

The logic, which until now was only influenced by society, became a sociologic one. The purpose of this rectification of knowledges is not to delight itself in relativism, as they accuse us wrongly, but to allow an investigation free of prejudices about discredited knowledges as well as about the accredited knowledges. The gain is not philosophical, it is foremost empirical. (LATOUR, 1983a, p. 174).

It is expected that some of the discussed questions contribute to tread the path of ‘ethnography of knowledges and techniques’ to, not just improve the interlocution in the field, as well as contribute to the reinforcement of the local claimant power. Thus, the important intersection between traditional societies and the ‘modern society’ would be better perceived. This intersection in which traditional knowledges and techniques matter a lot in their contribution to the improvement of sustainability conditions in human-nature and society-nature relations.

¹⁰ In his article, Bruno Latour (1983a) refers to the French edition of David Bloor’s book (1983, p. 160). In the Brazilian edition Latour’s quotation would correspond to the page 207 of the section ‘The Azande logic and the western science’ (BLOOR, 2009, p. 207-219). The single quotation marks in the quotation that follows correspond to what Bloor writes and is quoted by Latour.

5. Ethnography of knowledges, techniques and practices, ethno-x and ethnomathematics

Ethnoscience, even though it has a considerable polysemy, keeps the idea of how ethnic groups construct their knowledges - or their *scientiae*. This construction occurs in the social interaction, with nature and with the space transformed by human action in relation with raw materials of the natural world.

The isomorphism between specialists of the science instituted by the Great Divide can be considered impossible, and, on the other hand, the specialists of the ‘popular knowledge’, ‘rural knowledge’ and local knowledges such as the indigenous (Image 2). This simple fact shows the difficulty for a scientist to represent the *scientia* of another ethnic group without projecting elements of his academic field knowledge on the other observed. From this he should only want to observe, listen and comprehend the other’s culture.

Darrell Addison Posey (1986) would suggest a methodology that proposes more symmetry and dialogicity in the field. Our adjustment to the references of the ‘other’ allows that our comprehension takes place from that studied universe of knowledge.

Questioning, simply, leads to the inhibition of the information flow on the part of the informant. The question: ‘how many types of X exist?’ it presumes that X is a valid *cross-cultural* category and that there are types of X identified and named in all cultures. ‘Is this the larva of the butterfly X?’ it supposes the notion of metamorphosis that can cease to explain the ontogeny in all societies. (...)

In general, the more open the question is, that is, the less restraining it is, the greater is the freedom left to the informant to answer according to its own logic and notions. Better said, the less questions, the better it is. For that reason, a ‘data generator’ methodology is recommended. In other words, insofar as the informant proposes topics and explanations fewer risks of harming the information are taken. (POSEY, 1986, p. 23-24).

Absorbing the universe of meanings of other culture requires a ceaseless effort of absorbing the phenomena from the references of this culture to the ones of its native categories. Simultaneously, the work keeps going on setting aside the disciplinary tools that should give way to the knowledges, techniques and methodologies of the ‘other’. From this ‘being there’, follows the ‘being here’ and the ‘writing here’. During the process there is the continuous presence of translation according to Geertz: making that the meaning to be expressed in the system ‘from there’, be expressed in the system ‘from here’ of the academy.

By the considerations above, in the body of knowledges of the other there is no space to any ethno-x, as X is a discipline of the academy. For instance, at times this author reached out the Kayapó of the Aldeia Gorotire to the interlocution with the aim of learning how they practice and elaborate their *scientia*. I focused on what they would know of sky-earth relations, of objects and natural and

spiritual entities, notions of space and of time and temporalities over days, months (moons), seasons, years and generations. Coming back with the field material, and then yes, there is the resource to disciplines as, for example, astronomy and the dialogue with the pairs of other specialties, by working with the field material, for example, with an ethno-astronomical method or other kind of analysis.

It may seem a really great absurd to say that in the example above Kayapó's ethno-astronomy was researched! This does not exist among the Kayapó as well as there are not any ethno-x. This is an area of knowledge from academy and not from the Kayapó that have other specialties.

In addition to this, in the 1980s when the author was a professor in the Institute of Physics at the University of Campinas (UNICAMP), he already dedicated himself to ethnoscience that would stir up interest although there were debatable views. An enthusiastic and inadvertent comment of a colleague about ethno-x was heard. In one of the sites, almost in the limits of the rural area in Campinas, here is that he finds an old woman that produced 'ash soap' (ashes, fat and water) in her backyard. Coming back to the 'being here' he tells what he had found and, surprised, he exclaims: 'See for yourself! Even that old woman makes chemistry!`.

This prejudiced observation and worth of a 'Great Divide' is marked with ambiguity between the enthusiasm for the encounter with a popular knowledge and for the judgment of the ignorance from the accredited knowledges such as the chemistry ones. The informant sentence - 'even that old woman makes chemistry!' - about knowing how to do ash soap, mentions something that 'we' know how to do so well using chemical science. In other words, the term 'even' contaminated with prejudice, it seems to be used, even more to elevate the value of the chemical science that does not exist to anyone.

The prejudice against 'other knowledges' is so strong as - how was commented - someone saying that goes to the field to research for 'the ethno-astronomy of the Kayapó', 'the ethno-mathematics of the Rikibatsa' or any ethno-x of an ethnic group. Observing the stars over the time and the sky-earth relations (CAMPOS, 2006), counting, measuring and knowing how to deal with space and its dimensions (FANTINATO, 2004); ethnographic records as those are what can be unveiled from other culture through an ethnography of knowledges and techniques to, once at the academy, work interdisciplinarily with methodological techniques of the ethno-x.

Among the 'ethno-x', the term *ethnoscience* comes up at least since 1957, however, the usage of the prefix 'ethno' is originated long before, as evidence of the series/sequence excavated by Giorgio Cardona (1985, p.15) in a spoil of the literature about the issue and represented in the Chart 1.

Chart 1 - Appearance of new ethno-x over the years.

| | |
|-------------------|------|
| ethno-conchology | 1889 |
| ethnobotany | 1896 |
| ethnozoology | 1914 |
| ethnogeography | 1916 |
| ethnobiology | 1935 |
| ethnoherpetology | 1946 |
| ethnoscience | 1957 |
| ethnomycology | 1960 |
| ethnoichthyology | 1967 |
| ethno-ornithology | 1969 |
| ethnomineralogy | 1971 |

(CARDONA, 1985, p. 15).

It is noticed that the Chart 1 does not comprise the term ethnomathematics, used and well-established until today by Ubiratan D'Ambrosio (1990, p. 5-6) as “the art or technique of explaining, knowing and understanding in the different cultural contexts”.

It is interesting that in the D'Ambrosian characterization of ethnomathematics, the term mathematics, one of the x disciplines in this author's point of view, does not appear explicitly. For this author, the ethnomathematics referred by D'Ambrosio cannot be considered an ethno-x. In that definition of ethnomathematics, the absence of the discipline mathematics could be justified if we consider it associated with terms such as *mathematikós* that from Greek is related to scientific or ‘inclined to learn’, or *mathêma*, related to ‘science’.

For etymological arguments, D'Ambrosio (1990) searches a generic enough and non-disciplinary definition of the term which almost transcend an ethnoscience and seeks to go beyond: “In this conception, we approach a theory of knowledge or, as it is modernly called, a theory of cognition.” (D'AMBROSIO, 1990, p. 6). By etymological argument foregoing any discipline, including mathematics, its ‘theoretical stance’ contains:

... *ethno* is accepted today as something very wide, in relation to the cultural context, and therefore, includes considerations such as language, jargon, behavior code, myths and symbols; *mathema* is a hard root, that goes in direction of explaining, knowing, understanding; and *tica* comes surely from *techne* that is the same root of [the words] art and technique. Thus, we could say that ethnomathematics is the art or technique of explaining, knowing and understanding in different cultural contexts. (D'AMBRÓSIO, 1990, p. 5).

The present discussion, from a reference of past thirty years, is justified because it is, at least until 2020¹¹, systematically used by the author and his followers when it comes to the D'Ambrosio's conception about ethnomathematics, also summarized by him in an article in 2018:

Why not *ethno* [for a group of myths and compatible behavior values commonly accepted] + *Techné* [for ways, arts and techniques] + *mathema* [for explaining, comprehending, learning]. My proposal is a research program to understand the 'tics' of '*mathema*' in different *ethnos*. All three together form *ethno*+ *mathema* + tics or, as it would sound much better, ethnomathematics. (D'AMBROSIO, p. 28, 2018).

The second aspect has to do with the difficulty in explaining the meaning of the suffix 'tica' that was raised by Fabio Lennon Marchon (2016) when wondering 'What '*tékhne*' is this of the 'tic' from ethnomathematics?'

Thus, the researcher affirms that *tic* has its etymological root in *tékhne* that is the same of *art*. From there, the understanding that Ethnomathematics is either the art or technique (of doing something specific). However, it does not seem completely evident that 'tic definitely comes from *techné*' (D'Ambrosio, 1990, p.5). And even if this is an inescapable fact (knowing that *tic* comes from *techné* and that its meaning is art or technique), even so the concept at issue can be questioned philosophically to search for meanings that are not evinced in the D'Ambrosian ethnomathematical text. (MARCHON, 2016, p. 4).

Frequently, ethnomathematics has also been referred, despite being with certain inconsistency, in this author's understanding, as a methodology of education in sciences and mathematics.

Despite that, the associations with mathematics, as a discipline, are very frequent. Paulus Gerdes (1993) characterizes ethnomathematics basically as 'cultural anthropology of mathematics and of mathematical teaching', as in the following to give it a quality a little more general as 'the study of the practices and of the mathematical ideas in their relations with the set of cultural and social life'.

Finally, an important question occurs between this conceptualization that seems to be quite extensive and widespread of Ubiratan D'Ambrosio about ethnomathematics (*ethno* + *mathema* + tics) and what to do when 'being there' in the field dealing with, perhaps, a liminality from a bigger order

¹¹ On October 2 2020 the 'Programa Dá Licença' [Program Excuse me?] and the GETUFF, both of the Fluminense Federal University (UFF- BR) organized the 'Round-table - Ethnomathematics, ethnoscience and decoloniality' that counted on Ubiratan D'Ambrosio, Marcio D'Oliveira Campos and the moderation of Maria Cecília Fantinato. At it, D'Ambrosio repeated, as in 1990, his same conception of ethnomathematics between the minutes 59:03-1:01:01: "What I want for the Program of Ethnomathematics is to understand the 'tics' of '*mathema*' in different '*ethnos*'. It is much wider than doing almost an ethnography from what exists, but you want to know how it came to this situation. This is the essence of the Program of Ethnomathematics" (59:03-1:01:01). Available in: <<https://www.youtube.com/watch?v=3uGOHb0UXbI&t=8s>> [2:07:10]. Accessed on Feb. 13, 2021.

than the triple liminality of the Image 3. That is because not in an uncommon way, it is discussed at the academy whether mathematics is a science and whether it could be considered as a language.

All this leads to the question about with what resources the postgraduate student arrives to the field for research? Could it be supposed - what seems quite hard - an approach to the 'native' by a very wide bias of the 'theory of the knowledge' or of the 'theory of cognition'?

This would seem to leave the specific aspect of the sociocultural product of the local ethnic group into background for the benefit of the investigation of thought which is unique as a process (GEERTZ, 1989).

Either, by other approach, knowledges and practices would be searched in which, for example, the numerical count and many properties related to categories of space and place experienced in daily life were identified? Ethno-x?

These last knowledges and practices as a material of ethnographic investigation, would be brought then to the context of the academy to be analyzed interdisciplinarily in the 'being here', were approached - considering they seem to relate to arithmetic and to geometry - predominantly by ethnomathematics and other ethno-x that would show themselves necessary to interdisciplinarity to win the impossibility of isomorphism between the different contexts of knowledge.

Concluding, the definition of ethnomathematics according to Bill Barton (2004) seems to have the value of solving some of the difficulties presented in the comparison between ethnomathematics and ethno-mathematics:

Ethnomathematics is a research Program on how cultural groups understand, articulate and use **concepts and practices that we describe as being mathematical**, whether or not the cultural group has a mathematical concept. (p.53). [Emphasis added by the author]

In this way, we are freed, in a more general way, from hunting our disciplines in studied social groups, limiting ourselves only to translating culturally and bringing to our academic world the "*concepts and practices that we describe as*" or that approach some of our academy disciplines.

6. Concluding Remarks

From what was discussed it is necessary to direct attention to the danger when scholars arrive in the field among 'natives' and try to identify specific aspects of their academic disciplines, there in the field where they do not exist - nonexistent isomorphism!

To try gathering constitutive elements of the academic disciplines proper to researchers when going to the field suggest identifying them metaphorically as hunter-gatherers of elements that add value, at the academy and without symmetry, to their disciplines present in science as an institution.

By having this delusive way of dialogue with the 'native', the Great Divide is exerted and elevated, what was severely criticized here and also ironically referred to by Bruno Latour.

7. Acknowledgements

I appreciate the precious revisions and discussions with Jéssica Ferreira, Cristina Martins Fargetti and Madalena Mattos Pontes during the drafting of this article.

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