

# GEOTECHNOLOGIES IN ACADEMIC GEOGRAPHY AND SCHOOL GEOGRAPHY AND THEIR EDUCATIONAL DEPLOYMENT

AS GEOTECNOLOGIAS NA GEOGRAFIA ACADÊMICA E NA GEOGRAFIA ESCOLAR E SEUS DESDOBRAMENTOS EDUCATIVOS

LAS GEOTECNOLOGÍAS EN GEOGRAFÍA ACADÉMICA Y GEOGRAFÍA ESCOLAR Y SUS DESDOBLAMIENTOS EDUCATIVOS

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## Abstract

The purpose of this text is to consider the cartographic and remote sensing languages whilst thinking about the composition of a force field that is inseparable from thinking space and corporeity, including its paradoxes. From the perspective of a micropolitical analysis in the deleuzian-guattarian key, elements of symbolic cartography such as scale, projection and symbology are employed to operate with maps and tributary images of remote sensing, aiming to understand space and corporeity in a multi-scale way. Thus, we generated crossovers from a micropolitical perspective between diverse educational practices with elementary school students, between 9 and 10 years of age, from elementary education, 4TH Grade, and students from the Science Teacher Education Program (LCN) at the School of Arts, Sciences, and Humanities (EACH) - São Paulo University (USP) in Brazil.

Keywords: Geographical education, Cartography, Remote Sensing, Micro-politics.

## Resumo

O propósito deste texto é pensar com as linguagens cartográfica e do Sensoriamento Remoto a composição de um campo de forças indissociável do pensamento do espaço e da corporeidade, bem como seus paradoxos. Perspectivados desde uma analítica micropolítica, no registro deleuze-guattariano, elementos da cartografia simbólica como escala, projeção e simbologia foram empregados para operar com os mapas e com as imagens tributárias do Sensoriamento Remoto, objetivando compreender o espaço e a corporeidade de modo multiescalar. Assim, produzimos cruzamentos desde uma analítica micropolítica entre práticas educativas junto a escolares do ensino fundamental 1 da educação básica e estudantes de graduação da Licenciatura em Ciências da Natureza (LCN) da Escola de Artes, Ciências e Humanidades (EACH) – Universidade de São Paulo (USP).

Palavras-chave: Educação geográfica, cartografia, Sensoriamento Remoto, micropolítica.

## Resumen

El propósito de este texto es, a través de los lenguajes cartográficos y de la Teledetección espacial, pensar la composición de un campo de fuerzas indisoluble del pensamiento del espacio y de la corporeidad, así como sus paradojas. Desde una perspectiva analítica micropolítica, en el registro deleuze-guattariano, se emplearon elementos de la cartografía simbólica como escala, proyección y simbología para operar con los mapas e imágenes tributarias de la Detección espacial. Esa acción fue realizada con el objetivo de comprender el espacio y la corporeidad de modo multiescalar. De esa forma, producimos cruzamientos desde una analítica micropolítica entre prácticas educativas junto a escolares de la enseñanza primaria de la educación básica y estudiantes de graduación en Ciencias de la Naturaleza (LCN) de la Escuela de Artes, Ciencias y Humanidades (EACH) - Universidad de São Paulo (USP).

Palabras clave: Educación geográfica, cartografía, Teledetección espacial, micropolítica.

## Introduction

The title of this text, separating school Geography from academic Geography refers only to a didactic strategy, for I think one is embedded and implicated in the other. I will approach languages normally placed within the disciplinary field of Geography, both in the academic and school contexts. Such languages include maps and remote sensing images, and they do permeate the daily life of many social groups. But we aimed at blurring the boundaries of their uses, function and ways of thinking, of conceiving and of acting in space. The representational *modus operandi* of maps and of the languages of remote sensing pose us issues that shoot out in many directions: to equate the map or image as being the geographic space itself; to flatten the creases of the sites under the bidimensional perspective of such languages; the bodily experiences that, embedded in space, compose another scale repertoire: the force with which the down-to-earth things<sup>1</sup> take us by assault when we engage them.

I shall call the crossover of these three directions the 'micropolitical composition immanent to human corporeity and to the things with which we deal in the ordinary quotidian struggle': the body and the place as connective forces in the forge of an *agencement* of corporeity as space. So I will operate theoretically with the notion of micropolitics in an attempt to evade the dualisms imposed by many cartographers and geographers in dealing with the languages, so-called geographic, which traverse us all, constituting part of our latitudinal and longitudinal bodily and spatial lines.

Here it is, then, the first part of this text we shall examine. Then, I will briefly approach the concept of space in Doreen Massey and Milton Santos, problematising the practice of spatialisation as a synonym for the distribution of phenomena on a two-dimensional space. This practice, ratified since the advent of images coming from geotechnologies in the scopes of school Geography and academic Geography, instead of being operationalised with different languages one in relation with another, in various scales, became just a procedure to fixate occurrences and render visible phenomena on the smooth surfaces of maps. Thence, landscapes became portraits with the aim of fixating territorial identities to the places.

Finally, I will present the results of a study on the deployment of vertical aerial photographs in the school context, as well as the use

of a revolving virtual globe, widely known as *Google Earth* (GE), in the training of Sciences teachers – a school discipline that also finds in space the anchorage for its social and discursive practices, though not always recognised by professionals in this area of knowledge – within the environment of the graduation-level teachers' training in Nature Sciences (LCN), at the School of Arts, Sciences and Humanities (EACH)<sup>2</sup> of the University of São Paulo (USP).

### Micropolitical composition

With different scopes and agendas, between November 2015 to May 2016, there were two occupation waves in Brazilian schools: one in the state of São Paulo; and the other, wider, scattered over 22 Brazilian states. Singer Marisa Monte, on the occasion of the second wave, gave a brief performance in one of the occupied schools in Rio de Janeiro, where she declared:

[...] Love is present only in **micropolitics**. In **macropolitics** there is no love, I've come to this conclusion. This is how we are going to change things. There is nothing constructive up there. It is collapsing on its own, we don't need to do anything. Let's remove the rubbish from the streets, plant trees. **Each one doing his or her part, discovering micro-politics inside oneself.**<sup>3</sup> (my emphasis)

The singer started by opposing micropolitics to macropolitics. But one is enmeshed in the other, and they involve, above all, life, from its biopolitical management, encompassing public policies on the macro and micro scales, to the quotidian maintenance of bodies. If understood as a synonym for action in spaces and places, circumscribed to the scale of the detail, micropolitics loses its analytical strength and can become a trap. The utterances with non-geographic identities, though not less geographic, in the sense that an analytics that crosses the oppositions between micro and macro, are important, because as they are not attached to a disciplinary identity, its utterances and writings become more porous, due to the passages they carry out between disciplinary borders. Both geographic authors, defined by adjectives, and geographer authors, defined by nouns, will help us out, from now on as we start with the second part of Marisa Monte's speech, as quoted above. Let's repeat it: "Each one doing his or her part, discovering micropolitics inside each one", after

all, between the scale of the tiniest detail to the most generalised, the are infinitesimal connections.

Micropolitics refers, then, to the crossing over of wider social occurrences with those regarding down-to-earth things.

Between these two levels, there is no distinctive opposition that depends of a logical principle of contradiction. It seems difficult, but one has to simply change logics. In quantum physics, for instance, it was necessary one day for physics to admit that matter is at once corpuscular and wavelike. (Guattari, 2013, p. 149).

Although neither Gilles Deleuze or Félix Guattari are geographers, their production holds a very wide theoretical body to think things qualified as geographical, for everything is. The geographical dimension would be immanent to space itself and the corporeities that animate it. In this sense, Portuguese sociologist Boaventura de Sousa Santos (2000, p. 197) states:

All the concepts with which we represent the reality and around which we build the different social sciences and their specialisations, society and the State, individual and community, city and countryside, social classes and personal trajectories, production and culture, law and violence, political regime and social movements, national identity and world system, all such concepts have a spatial, physical and symbolic contextures, which have evaded us because our analytical instruments turn their backs to it, but which, we now see, is the key to the understanding of social relations of which such concepts are made of. Thus, the way we imagine the spatial real can become the matrix of the references with which we imagine all the other aspects of reality.

Let's consider, briefly, the writings of Doreen Massey (2008) and Milton Santos (1997); each one has theorised, each in his/her own way, about the conceptual space-time dyad. I believe there are connections between the two, because, they have both resolved the classic dichotomy between human geography and physical geography. Massey as she declares that space is about the meeting of human and non-human trajectories up to now; Santos, as he states that space can be read as a set of fixed elements and fluxes solidarily indissociable. Furthermore, such theorisation has contributed to our thinking about maps as forces of interpellation that, in connection with other imagetic languages, such as those tributaries of remote sensing, debunk the simplified and superficial reductionism that

maps constitute the geographic language par excellence, because “images do not speak in isolation, we need to place them in relation” (Campos, 2017, p. 269), a task I will undertake below.

### The images of geotechnologies in academic Geography and school Geography

Images, both in school Geography as in academic Geography, generally, especially maps, hold a place of importance in the geographers’ and Geography teachers’ discourses. A study may even be considered more or less geographic depending on the employment or not of maps. However, that which the geographic images represent, do not constitute geographical space or the places in their totality. Almost automatically, one recalls the classic canvas by Belgian Surrealist painter René François Ghislain Magritte (21/11/1898 - 15/08/1967), *The treachery of images* (1929).



Figure 1 – The treachery of images, 1929.

Source: <<https://www.renemagritte.org/the-treachery-of-images.jsp#prettyPhoto>>

Accessed on: April 5 2018.

Would the same pun apply to space as we gaze at a map? I believe so; we gaze at a map and immediately think: *Ceci n'est pas l'espace* – This is not space (Figure 2)

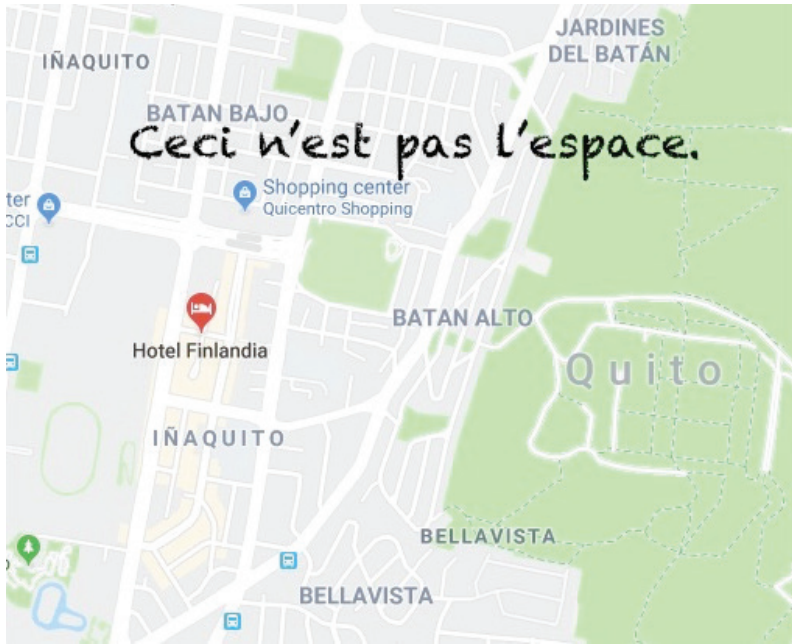


Figure 2 – The treachery of maps

Source: Adapted from the Google Maps platform. Accessed on: April 12 2018.

Doreen Massey (2008, p. 20) brings our attention to the “association of the spatial and the fixation of meaning. Representation – indeed conceptualisation – was conceived as spatialisation”. Not all views from above are problematic, but the issues emerge only “[...] if we start to think that such vertical distance brings us the truth [...], that maps (present-day Western maps) give the impression that space is a surface – which is the sphere of a complete horizontality” (Massey, 2008, p. 107). The conception of space suggested by maps can also be extended to remote sensing images; satellite images and vertical aerial photographs made available in virtual platforms, such as *Google Earth* and *Google Maps*, ratify the conception that space is a smooth surface ready to be traversed, conquered.

The issue is not to be for or against maps, or for or against languages that flatten creases of the places, but, instead, in the issue of how to evade the traps of these very languages as they transform everything into a smooth surface, employing the same elements that have forged them, such as scale, projection and symbology?

### Images in geographic research and their scope

In academic geographic studies, remote sensing<sup>4</sup> images have been employed to ground the geographic and cartographic production about several themes: from the “old” oblique and vertical aerial photographs (B&W and/or colour) to the “recent” orbital images, commonly known as satellite images, and radar images. The quotation marks used for the adjectives above are to indicate that aerial photographs and orbital images co-exist. If, today, we find mass use of orbital images, especially in the academic and scientific contexts, it is not because they are better than vertical aerial photographs. It is because of the advantages they offer in the process of capture, such as periodicity, spatial<sup>5</sup> and radiometric<sup>6</sup> resolutions, as well as the storage of data about the terrestrial surface, rendering the production of this kind of language more efficient from the point of view of cost/benefit. It is costly to undertake an aerophotogrammetric survey, the advantage of orbital images in relation to vertical aerial photographs consists in obtaining “temporal information for updates and prognostics of a geographical region with the periodicity of up to four days at an approximate cost of R\$55 to R\$180<sup>7</sup> per square kilometre” (ASSIS, 2001, p.15) and with an increasingly detailed spatial resolution, before possible only with vertical aerial photographs.

The fact is that geotechnologies, including remote sensing, digital cartography, the Global Positioning System (GPS) and the Geographic Information System (SIG) “are part of the tendency of building an infrastructure geared towards the acquisition, processing and analysis of information regarding the geographical space that seeks to rationalise the decision making process” (Matias, 2005, p. 8887). However, “one must pay attention to the true meaning of such technologies in the scope of the geographic sciences” (Ferreira; Matias, 2011, p. 3), in the sense of strengthening geographic concepts, since it is not the use of SIG that will improve a new generation of geographers, but it is the users of SIG who will

improve as they deepen their knowledge of Geography (Ferreira; Matias, 2011, p. 10). Geotechnologies, such as remote sensing, have allowed for the spatialisation of geographic phenomena in different scales, providing

[...] a multitemporal overall view of extensive areas of the Earth's surface. This synoptic view of the environment or of the landscape allows for integrated regional and studies, involving various fields of knowledge. They show the environments and their transformations, they highlight the impact caused by natural phenomena such as floods and the erosion of the soil (often aggravated by human intervention) and anthropic interventions, such as clearing of vegetation, slash and burn, urban expansion, or other changes of use and the occupation of the land. (Florenzano, 2005, p. 24).

Ferreira e Matias (2011), with Gilberto Câmara and other authors, state that, despite the advances carried out by scholars in the last two decades, geotechnologies “are still far from giving adequate support to the different conceptions of geographic space” (p. 3), because SIG technology, for instance

[...] has solved only the simple problems of computational representation. The present-day systems are intensely based on a “cartographic” logic, always demanding the construction of “computational maps”, a costly task and not always adequate to the problem at hand. (Ferreira; Matias, 2011, p. 3)

In this sense, the hypothesis supported is that the geographic images produced within the scope of geotechnologies continue to ratify a spatial cosmology “like in the travels of the Discoveries [...]. Therefore, this way of conceiving space can thus easily lead us to conceive other places, peoples, cultures, simply as a phenomenon ‘on’ such surface” (Massey, 2008, p. 22-23).

### Images in the context of school Geography and their scale of scope

Regarding geographic educational texts geared towards the school context, the map have constituted, in the course of the establishment of the school discipline of Geography, one of the main languages to present geographic space in generalised scales. From the end of the 1990's, such texts have also incorporated the images of remote sensing, integrated to



didactic books, geographic atlases, and municipal and school atlases; the latter published in Brazil at the end of 1990's.

In the geographic atlases, remote sensing images, especially orbital images of high spatial resolution used by the Google Earth platform, were used to present wider scales of the national territory, differently from its employment in municipal and school atlases, where they were incorporated to present the place where one lived in more detailed scale. Although these two types of atlases cater for children and teenagers in a school context, both deal with different spatial scales, possibly implying also distinct bodily actions and spatial thinking. One is not advocating for an ideal model for an atlas, with more or less generalised images, for their use presenting their differences and limitations, because to think in various scales is one of the geographic reasonings necessary to act in space and on the body.

The amount of remote sensing images has grown in the publication of geographic atlases during the 1990's, besides its profusion in Geography didactic books (Cazetta, 2011, 2013). But, in both sets, orbital images were incorporated in quantity and with different aims. This subject has been highlighted in most of the Geography didactic collections for elementary education and middle school, and, together with Cartography, is associated to a set of themes linked to new technologies. However, the greater number of pages bearing satellite images is in the geographic atlases.

Such predominance can be explained, though laconically, by the fact that this type of image can be accessed "for free" by means of various virtual platforms: *Word Wind*, *Google Earth*, *Visual Earth*, besides the sites of research institutes such as the National Institute of Spatial Research (*Instituto Nacional de Pesquisas Espaciais*- INPE) and the Brazilian Company of Agriculture and Cattle Research (*Empresa Brasileira de Pesquisa Agropecuária* – Embrapa), where this kind of language is made available, instead of aerial photographs (vertical and oblique), which involve the high costs of aero-photogrammetrics, as mentioned above. This kind of photography can be obtained in analogical or digital collections at municipal secretaries of urban planning, universities or research institutes.

I will present, in the next section, the educational potencies of images, grounded on the use of the two types of atlases quoted above, as well as of vertical aerial photographs (in black and white) of the São

Paulo State municipality of Rio Claro, with 9 to 10-year-old children in municipal schools; and the deployment of images from the virtual platform *Google Earth* as we worked with students of the teacher training course in sciences at EACH-USP.

Of quotidian spatial and visual knowledges: teaching experiences with schoolchildren by means of cartographic and photographic languages of remote sensing

The experiences of using vertical aerial photographs and other geographic languages were attempted in two public schools in the São Paulo State municipalities of Rio Claro: one sited in the central area and another sited in the outskirts of the city, with Geography groups from the 4th grade of elementary education, constituted by 20 pupils each, at the end of the year 2000. The aim of the didactic sequence was to propitiate experiences with the teachers and pupils, employing photocopies of vertical aerial photographs of Rio Claro (B&W; graphic scale of 1 by 5.000; dated of June 1995), with excellent print quality, based on the geographic scale of their own bodies. This was possible thanks to our participation in two phases of the thematic project *Integrating University and School by Means of a Research in Collaboration: school municipal Atlases*, funded by São Paulo State Research Support Foundation (FAPESP)

I will now present each of the activities.

In the first activity we went out with the children for a walk<sup>8</sup> around the neighbourhood where the school is located, because most of them lived in the area, making it easier to have them confront their corporeal knowledges about the neighbourhood they lived in with the photographic knowledges from the vertical aerial photographs of the same area. Many children felt confused as they confronted their corporal knowledges with the information contained in the photograph each had in their hands, because they were presented a “reality” that, as seen and lived from the present, ceased to be such a credible document, after all, all the photographs were dated, i.e., they presented information in a specific past historical moment, and, therefore, were not a mirror to reality. After the “educational walkabout”, several activities were carried out with the children in the classroom, employing the same vertical aerial photographs mentioned above. I will relate now, by means of excerpts of what was said during classes, the continuity of this didactic sequence.

In the second activity the children were given an urban plan of the neighbourhood plus the vertical aerial photograph used in the “educational walkabout”, with the aim of comparing the photographic and cartographic languages, so as to discover both the limits and educational potentials of each one. A group of children said: “the map is easier, because it has the names of streets and places”.<sup>9</sup> We asked them which one they preferred, photograph or map. One of the pupils answered: “In the map I have the name of things and not in the photo, but one helps the other, because it is worse with the photo. Everything is so small!”<sup>10</sup> In this way, the children, as they read the names of the streets in the urban plan and transported them to the aerial photograph, forged the passage of the “educational walkabout” experience onto the photograph, rendering evident that those very names were important in their quotidian spatial and visual practices. And, therefore, the urban plan was easier, for, in it, there were references used by the pupils in their daily crossings of that territory. There was also a child who took out a magnifying glass from the knapsack in order to observe the aerial photograph. Was her trying to discover forms known to her in quotidian, but that were difficult to be identified in aerial photography because they are too small, even in a detailed scale? As the magnifying glass increases the size of what is seen, these already known forms – a corner, a square, for instance – would jump out to the eyes, facilitating a kind of opening of the photograph and its relation with lived space. These were doubts that remained unanswered, because we did not ask the pupil what led her to use the magnifying glass.

In another moment of the activity, the aerial photograph demanded, for its understanding and reading, the relation between the part and the whole – typical of the knowledge that can best be elaborated in photographs than in daily life, because in the images “we see everything at the same time” - as in the excerpt:

Teacher: *Why did you use the map in addition to the photo?*

Pupil 1: *Because on the map there are things written.*

Teacher: *What is the difference between the map and the photo?*

Pupil 2: *The map is drawn but the photo isn't. The photo gives more details than the map.*

Teacher: *What details?*

Pupil 3: *The maps shows only the outline. Here in the photo there are houses and on the map there is only the outline of the blocks.*

Teacher: *How are maps made?*

Pupil 2: *Aerial photograph. You can't see trees on the map. In the photo I see the vegetation.*

Teacher: *Which street has the most trees?*

Pupil 4: *Saudade Ave.*

Another passage between corporal and photographic knowledges took place when one of the children said that “the photo is wrong, because the fishmonger’s is not there, and the small farm is no longer that size. They have now built houses and the size of the area occupied by the small farm has diminished.”<sup>11</sup> By means of this statement it was possible to detect the presence of corporeal knowledges in the reading of the photographs, since the pupil questioned the veracity of photography grounded on such knowledges. She now knew that there was a fishmonger’s that was not present in the photograph. Passages that revealed the transformation in the lived space. But, “the day when this pupil says ‘the photo is old, this is because there are things in it that are different today’, then we will have reached another type of school knowledge” (Almeida et al., 2004, p. 54), less Manichean, as related by pupil Vinicius “*I discovered that this aerial photograph is different from my way from home to the school, because this photograph is of 1995 and does not show some points of reference that my quotidian route has*”<sup>12</sup>

With children from the second school, sited in the outskirts of the city and in the border between the neighbourhoods of Jardins Novo Wenzel, Bom Sucesso and Araucária, where the students lived, what caught their attention in the aerial vertical photograph was the presence of just streets, blocks and a few buildings. Nevertheless, the children were impressed with the “bird’s eye view” of the photograph. At the time, virtual platforms such as *Google Maps* e *Google Earth*, among others, had not been created.<sup>13</sup> The fact is the this “view from above” given by orbital images or aerial photographs still impresses people from all ages.

As the children rendered their knowledge and meanings more complex by observing the photograph of the neighbourhood they live in, they transported onto it their “existing knowledges of corporeal experience” (Almeida et al., 2004, p. 53), discovering absences and

permanences and, at the same time, giving plasticity to that flat landscape, as in this excerpt:

Pupil: *Is our neighbourhood not here?*

Teacher: *Your neighbourhood is very new and the photograph is of 1995 [...]*

Pupil: *So, how will we map our house if Jardim Progresso does not feature in the photo?*

Teacher: *Observe that in the photograph only the lots are featured. So you will have to give a mapped existence for the neighbourhood [...] Caren<sup>14</sup>, for instance, had the same problem, for her neighbourhood – Jardim Araucária – also did not feature in the photograph!<sup>15</sup>*

It was necessary to walk about the neighbourhoods to recognise the changes regarding that aerial photograph, because Jardins Novo Wenzel, Bom Sucesso and Araucária were no longer the same as they were. The children, then, set out to map the neighbourhood and, for that, transparent acetate sheets were handed out to be placed on top of the photograph. Twenty-two sketches were made and the neighbourhood was mapped. Each one of the sketches was very different from the other. Although the sketches were elaborated in the present, the mark making indicated a future times from the children, full of desires, demands, angst, fears and jokes, as in the excerpt below:

Teacher: *Do you remember how these photographs were made?*

Pupil: *It is from 1995.*

Teacher: *So, it is not that old .*

Pupil 1: *I was one-year-old and the teacher was fifteen already.*

Teacher: *Is this different regarding the things that we see today in these neighbourhoods close to the school?*

Pupil 2: *The little gas station was not there.*

Pupil 3: *In the photo, the neighbourhood is more beautiful. There are a lot of shacks near my home and they make the neighbourhood ugly!*

Teacher: *Do you think if they were regular houses it would be better? What do you think?*

Pupil 3: *We need to speak with the mayor.*

Teacher: *Do you know tomorrow there is a meeting about the Participative Budget. In other words, we must think of a map for the Participative Budget.*

Teacher: *For instance, there is a water tank that is not working in Jardim Novo Wenzel. The one in Jardim Bom Sucesso does work.*

In this mapping process “more than noting down the location of streets and avenues onto the map, the life stories told by the pupils and by the parents in meetings or in informal conversations were remembered.”<sup>16</sup> In this case, it is difficult to pin down which of the languages have incurred passages through corporeal, photographic, cartographic and other knowledges, for the circumstances spread out to the context of the neighbourhoods adjacent to the school, weaving maps and photographs in the understanding of such local geographies. The passages through corporeal knowledges, demanded by the aerial photograph and the sketches elaborated by the children, compelled that group’s teacher to widen the activities. Pupils did an interview with a couple of elderly dwellers who led the Jardins Novo Wenzel and Bom Sucesso Dwellers’ Association. They came to the school to tell the students of their life stories that crossed over with the history of all dwellers in the neighbourhoods. All were migrants and despite being seemingly devoid of the triad inhabitant-identity-place, in those peripheral geographies, it was being produced and imbricated with the history of the neighbourhoods that is also the story of each dweller of the place (Carlos, 1996).

### Teaching experiences with teachers in training: the Google Earth platform

In this part, I present a didactic sequence constituted by four activities developed in the context of a discipline offered to students of the Teachers Training Programme in Science, at EACH-USP, aiming to present and discuss the educational potential of the use of geographic images in teachers’ training. With Portuguese sociologist Boaventura de Sousa Santos (2000), quoted in this text in the item Micropolitical Composition, I state here that spatiality is pertinent to all the areas of knowledge and, therefore, and I believe in the importance of problematising, in a Science teachers training course, the cartographic images and orbital images synchronically made available at the Google Earth platform,.

The three activities of the didactic sequence were developed in the university's IT lab. For the first activity, we adapted from Almeida, Sanchez and Picarelli (1996), Table 1 with the aim of exploring together with the undergraduates the differences between the languages of cartography and orbital images. The maps were employed together with the orbital images to explore the educational potential and the limits of each language.

	What one sees	What one does not see
<b>Orbital images</b>	Everything that has been framed from a certain spatial resolution in which the orbital image was obtained. Although the image flattens the creases of places, is more familiar because it resembles the aspects seen and lived in the quotidian routes taken around the city	The name of things. But the urban hydrographic network of pipes remains invisible, because it is under the tarmac. One notices the existence of the rivers because of the smell that emanates from them, invisible in the images.
<b>Maps</b>	Here information is always represented in a selective manner. If the scale is big, there will be more details of the mapped data; if, on the contrary, the scale is small, there will be generalisation of the information mapped.	As space was reduced to the second dimension, it became something possible to be imagined as a horizontal surface. And, in opposition to the orbital image, here it is not possible to see things and the forms with which our eyes are used to.

Quadro 1 – Cartographic scale: between detailing and generalisations

Source: Adaptation from Almeida, Sanchez and Picarelli (1996, p. 11).

On the *Google Earth* platform it is possible to see a given place both as an orbital image and as a map; see, because all the creases of the terrestrial surface are flattened in both languages, due to the vertical point of view adopted in maps being similar to that adopted by orbital images. It is interesting to highlight that in this platform the orbital image is not presented to the detriment of the map. On the contrary, a more polysemic and less codified language, such as the orbital image, composes a platform with the maps, coded language. There has been some time now that the platform incorporated the tool Street View, with which it is possible to view photographically, on ground level, many places on Earth. But one must be careful with imagetic stereotypes. Let's take as an example the *Amazonas*<sup>17</sup> collection. It photographically homogenises and renders dense a very complex and diverse state of Brazil, by means of 28 photographs, thus presenting only three rivers (Negro, Mariépauá and Aripuanã) among numerous others in the vast Amazonian hydrographic

basin; small stretches of an extensive jungle; a few communities (Tumbira, Santa Helena and Saracá), and a trail in a section of the jungle claimed to have been reforested. I ask: can these photographs express the complexity of the area? Besides, the title of the collection refers to one of the 27 federal units of Brazil or only the river of same name in the State of Amazonas? Wouldn't such images produce a stereotypes collective imaginary regarding the socio-biodiversity of the area?

The second activity meant to present the concepts of region, state and municipality, from figures 3, 4, 5 and 6, taken from the *Google Earth*. Platform.



Figure 3 – Orbital image and the states of the North-east region

Source: Plataforma Google Earth. Accessed on: 26 mar. 2013.





Figure 4 – Orbital image with indication of the site of the municipality of Serrinha, State of Bahia

Source: Plataforma Google Earth. Accessed on: 26 mar. 2013.



Figure 5 – Photographic and imagnetic mosaic

Source: Plataforma Google Earth. Accessed on: 26 mar. 2013.

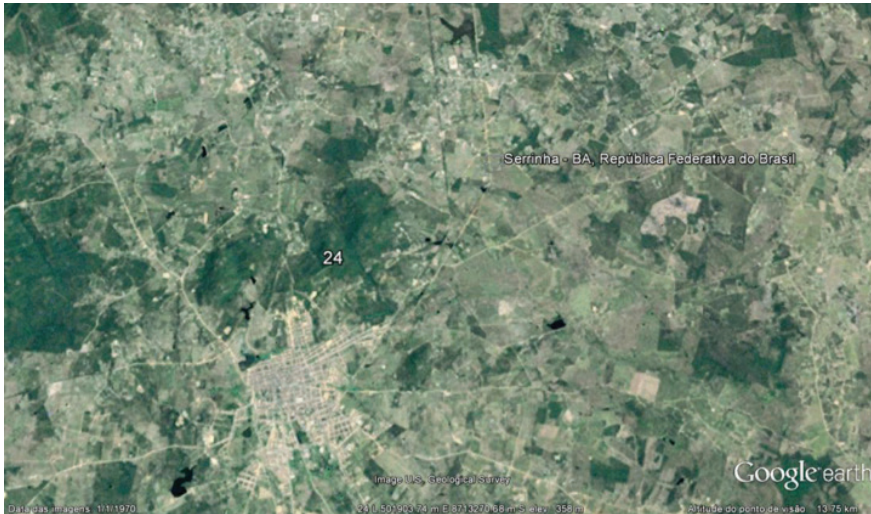


Figure 6 – Orbital image of the municipality of Serrinha (BA)

Source: Plataforma Google Earth. Accessed on: 26 mar. 2013.

In Figure 3, we highlighted the nine states that compose the Northeast region. In Figure 4, we draw attention to the location of Serrinha in the State of Bahia; in Figure 5, municipalities adjacent to Serrinha (indicated by a red circle in lower section of the image) are presented by means of a imagetive mosaic, assembled from orbital images, and colour and B&W vertical aerial photographs obtained in different times; and, finally, in Figure 6, the municipality of Serrinha is presented in a more detailed scale, but the image is not sharp.

Let's return to Figure 5. As we observe it, it is possible to detect the date. Each of the two markings (A and B) that we did on Figure 5 correspond to the different dates of capture. Stretch "A" was obtained in 3/07/2001<sup>18</sup> and corresponds to the orbital image; and the stretch "B" in 1/1/1970, corresponding to a vertical aerial photograph. Still in this image, it is possible to read "*@2013 Map link/Teleatlas; Image U.S. Geological Survey; Image @2013 Geo Eye*". That is, the images that compose the mosaic at the Google Earth platform are not made "in real time" and "no matter how recent the data, the dream of being a 'camera' filming everything from space remains just that, a dream" (Oliveira, 2007, p. 49).

The aim of presenting figures 3,4,5 and 6 was to de-naturalise, in the Science Teachers' Training Course, concepts such as region, state and municipality, seen from the perspective of symbolic cartography by means of three cartographic mechanisms of reality production: scale, projection and symbology (Santos, 2000; Cazetta, 2005; Seemann, 2005), for "as important as to know that things change with size is to know exactly what changes and how" (Castro, 2003, p. 121). The scale corresponds to a strategy of approximation to the real, including

[...] both the inseparability of size and phenomenon, which defines it as a dimensional problem, and the complexity of the phenomena and the impossibility of apprehending them directly, which also poses a phenomenal problem. (Castro, 2003, p. 118).

Cartographic projections, in their turn, create visions of the world. Cartographers, as they transfer information from the terrestrial sphere into the two-dimensional plane, they inevitably create distortions<sup>19</sup> on the map, because it will always be centred in a specific point, creating centres and peripheries (Seemann, 2005). Symbology, in its turn, can be of two types: one based on "cartographic grammar", and another anchored in subjectivity, "linked to the perceptions and meanings attributed by people to this supposedly objective language that is graphic representation" (Cazetta, 2005, p. 64-65). The first is conditioned by scale, projection and symbology; and the second problematises the generalisations produced within cartographic conventions.

In Table 2, extracted from Seeman (2005), one gets the idea of how I approached the three cartographic mechanisms applied to the reading of figures 3,4,5 and 6, as well as the images from the candid books by Istvan Banyai (1995a, 1995b), *Zoom* and *Re-Zoom*.

Producing and consuming agent	Scale	Projection	Symbology
Owner of the means of production and industrial means	Medium and large scale - Interest in infrastructure; - Networks and fluxes; and - Production instead of population.	Centred on the production process - Relations with the market (verticalities); and - Selective image of reality aiming the enterprise's profit.	Emphasis discourse - Seeks to advertise a positive image of enterprise; and - Incentive to production and consumption (propaganda).
Real estate agent	Large scale - Interest in buildings; - Capital instead of human values; and - Speculation.	Centred on buildings - Just a mapping of what matters: houses, flats, lots; quality of life; neighbourhood life; value of property and possible profit.	Persuasive discourse - Presentation of all the advantages involved in the acquisition of the real estate; and - Location, infrastructure, price etc.
State / Municipality	Small and medium scale - Generalisation: reduces the behaviour and attitudes to general types from abstract and statistical data; and - Political discourse; and - Urban planning	Centred on the whole city - Creation of privileged and marginalised spaces, segregation; - Urban planning; - Discourse of development; - Embellishment of reality: propaganda by means of the city's 'postcard' locations; and - Omission or reduction of periphery.	Political discourse - Masterplan, surveys, reports, legislation; - Welfarism/voluntarism; and - Tension: discourse X action.
Excluded social groups	Very big scale - Lived space, neighbourhood life, home, street, neighbourhood; and - Perception of details important to the group or the individuals; microterritorialisation.	Centred in the outskirts - Acceptance of the political discourse that defines the outskirts; - Personal and community projects	Militant discourse - Social movements, dwellers' associations, partnerships with NGOs; and - Articulation with the other agents

Table 2 – producing and consuming agents according to scales, projections and symbologies

Source: Seemann (2005, p. 13967).

In addition to the geographic discussion about the region, another approach was possible with other theoreticians, such as historian Durval Muniz de Albuquerque Júnior (2011), to whom the geographic region of the North-east did not exist until the mid-1910's. This author considers the North-east “[...] as a special identity, built in a precise historical moment, the end of the first decade of the last century and in the second decade, a product of the cross between ‘regionalist’ practices and discourses” (Albuquerque Júnior, 2011, p. 33). This proposal fits well my purposes regarding the present text. In other words, at the same time as we present educational potential of the apprehension of specific geographic themes, I sought to widen these by means of readings carried out outside the geographic scope, because it is necessary to break “with the transparencies of spaces and of languages” (Albuquerque Júnior, 2011, p. 33), which, usually, present geographic space as “as a flat surface, a continuous surface. Space as the completed product. As a coherent closed system.” (Massey, 2008, p. 106).

The third and last activity consisted of an “educational walkabout” around the university’s campus, aiming to compare the image extracted from the *Google Earth* platform with the corporeal knowledges that the teachers in training gained in their frequent movements inside the campus, after all, the orbital images were obtained “from the real”, not constituting reality itself. The images themselves were dated. These two interpellating aspects encouraged the students to look at the images in relation with other languages, such as maps, grounded on symbolic cartography and its elements of scale, projection and symbology. This has allowed for a sort of deconstruction of the orbital images, reassembled from the maps and the students’ spatial and bodily knowledges.

### Final considerations

In the present text, my argument ranged from micropolitics to the crossover of the micro and macro scales opposition, because corporeality in inevitable connection with space supersedes any such opposition. I have considered the set of maps and remote sensing images, generally, as images; I generalised knowing that each one of them obeys a distinct production process and, therefore, an also varied politics-aesthetics. Such problematisation became more evident when the results of the research

in the school's and in the university's environments were presented, as both types of language were employed. The first, operated with maps and vertical aerial B&W photographs, and the second from symbolic cartography grounded on the elements of scale, projection and symbology, employed to think space and its creases and corporeities.

Therefore, this way of thinking can dissemble and potentiate other re-assemblages of the languages invented by us in the institution of the many "reals", having in multiscale thinking, in the different points of view and in the proliferation of symbologies, the procedure to de-naturalise narratives that aim to homogenise a single way of life as an inevitable path of historical processes that, instead of being linear and universalising, are uncommon and contingent. In order to do so, it suffices to excavate the countless layers of occurrences of the ordinary and official geographies, such as those pointed at by children who live synchronically in the periphery and in the centre of micropolitical decisions.

## Notes

1 French philosopher, historian and art critic, Georges Didi-Huberman (2017, p.42) says that down-to-earth things are the first "to be seen", that is, they are those "we have 'under one's noses'".

2 For further information see: <<http://www5.each.usp.br/licenciatura-em-ciencias-da-natureza/>>. Accessed on: April 5 2018.

3 News piece available at: <<https://extra.globo.com/famosos/marisa-monte-fala-sobre-show-em-escola-ocupada-so-existe-amor-na-micropolitica-19233989.html>> Accessed on: April 5 2018.

4 The term was coined in the beginning of the 1960s, when aerial photography was the main remote sensor.

5 In the case of orbital images, the most adequate term is "spatial resolution" instead of "scale" – a concept applied to cartographic products. For Assis (2001, p. 12), "spatial resolution would be for remote sensing what the graphic scale is to aerophotogrammetry and for Cartography".

6 Consists in the capacity of a sensor to detect variations of radiation coming from the electromagnetic spectrum. In the case of photographic systems, the radiometric resolution of a sensor is indicated by the levels of grey recognised by the photographic film. In the case of optical electronic sensors on artificial satellites, the image will necessarily be presented in the digital format (numeric), because in this case the radiometric resolution will only be identified in the value band coded by the sensor (Chuvieco, 1996).

7 Roughly US\$13 and US\$45.

- 8 Two fifty-minute classes were needed. One of the school's inspector came along to accompany the two groups organised on alternate days to do the "educational activity".
- 9 Notes from the field notebook of day 31/10/2003.
- 10 Notes from the field notebook of day 31/10/2003.
- 11 Notes from the field notebook of day 13/11/2003.
- 12 Notes from the field notebook of day 13/11/2003.
- 13 The applicative *Google Earth* – conceived initially by *Keyhole* under the name *Earth Viewer* – was bought and made available "for free" by Google, in June 2005, with the aim of commercialising orbital images. But its popularisation unlocked other uses by society, and, among them, it is worth mentioning its use by artists. For further details see research by Leirias (2012).
- 14 Fictitious name given to the research subjects.
- 15 Notes from the field notebook of day 23/05/2003.
- 16 Told by one of the teachers, regarding the second semester of 2003.
- 17 Available at: <<https://www.google.com.br/intl/pt/streetview/#amazon>>. Accessed on: 10th January 2018.
- 18 In the images of the *Google Earth* platform, the American model of dating is adopted (*month/day/year*).

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