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ARTICLE

Difficulties in telling the truth: The composition of a philosophical activity and its unfolding into rigors-events

Dificuldades em dizer a verdade: composição de uma atividade filosófica e desdobramentos em rigores-acontecimentos

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Abstract

In this essay, we seek to problematize the modes of enunciation and validation of truth from discursive practices that support mathematical rigor. We question the aspects and circumstances by which a truth is constituted as such, seeking to intend its operation within mathematics. To this end, the text is divided into three acts that aim to develop the hypothesis that, being rigor a practice, it is an event.

Keywords: Philosophy of Mathematics Education. Philosophy of Mathematics. Archaeology. Michel Foucault.

Resumo

Neste ensaio, buscamos problematizar os modos de enunciação e validação da verdade a partir de práticas discursivas que sustentam o rigor matemático. Questionamos os aspectos e circunstâncias pelos quais uma verdade se constitui como tal, visando entender seu funcionamento no interior da Matemática. Para tanto, o texto é dividido em três atos, que buscam desenvolver a hipótese de que, sendo o rigor uma prática, ele é um evento.

Palavras-chave: Filosofia da Educação Matemática. Filosofia da Matemática. Arqueologia. Michel Foucault.

1 Anti-Prologue

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Throughout the process of writing this essay, our objective was to create a text that does not adhere to the conclusive and representative aspirations of a scientific writing style that combines objective analysis and interpretations with predetermined intentions. On the contrary, we embraced a diffractive approach, incorporating philosophical, epistemological, and methodological discourses. Our aim is to engage with the various aspects and circumstances through which truth is established within Mathematics. Consequently, we propose the hypothesis that rigor, as a practice, manifests as an event within the exercise of enunciation within a regime of truth.

It is important to clarify to our readers that, right from the opening line of this draft, our objective is not to draw definitive conclusions regarding the discussion at hand. Rather, we aim to utilize writing as a means of diffractive evocation, encompassing the enunciations presented here through various forms: textual, quotations, and even literary and poetic montages. Consequently, we embrace authors and concepts as unpredictable constellations that provoke a series of displacements and ruptures, challenging the inclination to rigidly fix academic arguments and uphold the presumed truth of a concept or theorist. In essence, our focus lies in exploring truth and rigor as philosophical activities within the realm of Mathematics Education, acknowledging the potential of writing – in addition to essayistic thought – as a residue that emerges from this process.

In this manner, the text can be understood as an attempt to embrace the imagery of these residues and demonstrate the processuality involved in their composition. It seeks to produce and affirm a form of writing that transcends the confines of the traditional argumentative logic of introduction, development, and conclusion. Instead, it finds its meaning solely in its casual and fleeting operation. We have encountered similar endeavors in articles by Clareto and Miarka (2015), Vianna (2015), Clareto and Carvalho (2016), and Miguel (2020). Each of these works, in its own unique way, explores this ephemeral pursuit of engaging in a philosophical activity within Mathematics Education. Simultaneously, they endeavor to capture ideas on paper without necessarily fully articulating them.

This invites us to consider the possibility of a writing that defies self-explanation, representation, or argumentation. Instead, it becomes a constellation of conceptual *rags* that allows readers to experience the composition firsthand. Therefore, we understand that the residues that constitute this work, when taken together, form a montage that transcends being a mere text or image. They are compositions that intricately interweave words and things, folding them one (und)(ov)er the other, intending to bring forth an inquiry into the notions of truth and rigor in Mathematics.

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In this context, we consciously distance ourselves from the prevailing inclination to constantly invoke the imperative of representing and arguing supposed epistemological analyses. Instead, we embark on an exploration to activate certain enunciations within the realm of writing in Mathematics Education, employing techniques such as montages and compositions. It is as if we strive to embrace a "kaleidoscopic writing" (Vianna, 2015), where each shift of our gaze reveals a multitude of senses, emerging from the serendipitous combinations that chance presents. Through this approach, we find ourselves drawing closer to Walter Benjamin's proposition in his book Passages, wherein our interest lies not in valuable analyses or clever arguments but rather in the assembly of residues and fragments. This becomes a way to affirm a writing that emerges to question the inherent challenges of expressing truth in Mathematics. In the words of Benjamin (2009, p. 502), adapting them to the plural form in this context, "We will not appropriate valuable things, nor will we seize upon clever formulations. Instead, we hold the rags, the waste—these we do not wish to merely inventory, but rather to grant them their due justice in the only way possible: by employing them" (Benjamin, 2009, p. 502).

With the aforementioned points, and to bring this anti-prologue to a close, it is crucial to underscore two significant considerations:

The first crucial aspect to mention is that this text was initially written in Portuguese and subsequently translated into English. This choice can be justified by multiple reasons. Firstly, the authors were driven by the desire to tackle the challenge of expressing in another language what they have been striving to develop within the realm of Brazilian Mathematics Education and academic writing. Secondly, the intention was to engage in a meaningful dialogue with the international community and share their dilemmas regarding truth and rigor in Mathematics, without adopting a definitive perspective. Hence, the objective was to promote an inclusive and broad-ranging research approach in Mathematics Education.

The second and final consideration encompasses an ethical, aesthetic, and political statement, as detailed in the preceding paragraphs. It is essential to emphasize that our intention is not to engage in a comprehensive discussion of all the residues that constitute our diffractive constellation, nor do we seek to produce an exhaustive inventory of research on truth and rigor in Mathematics Education through this essay. Such an approach would significantly deviate from the philosophical activity we present here. Instead, we invite the montages to function as a multi-perspectival display of enunciations, allowing you, the reader, to enter this text from any vantage point—be it through the residues that form it, the acts, intermezzos, or the anti-epilogue. We firmly believe that within each of these entry points, one can be confronted with

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endless philosophical, poetic, literary, filmic, and bibliographical combinations, all while questioning truth and rigor in Mathematics—regardless of whether you are inclined to read Nietzsche, Armstrong, or Lewis Carroll. It is important to acknowledge that our approach does not absolve us—nor should it—from grappling with the ever-present and persistently raised question: *But what about (scientific) rigor?*

1.1 Residues

— Answer me: if I say the truth, how do I prove it is true?

— It is enough to be rigorous in your arguments, that is, that you rigorously ground each particle of your truth. The veracity of your truth will be a consequence of the infallibility of the method applied in your enterprise.

— I see that now my question changes: how to prove that the rigorous method I use to show the veracity of my truth is rigorous enough to achieve the goals for which it was invoked?

— You want to know how to prove the veracity of the strictness of the rigor used to attest the veracity of your truth?

— Exactly.

2 First Act: Desire for truth and capture devices

To begin this essay, we take inspiration from four quotes, apparently different in their postulations and philosophical-epistemological structures, which mark a movement of *suspecting* the dimensions of truth, be them tied to the metaphysics of the being or to the earthly discursivity of the human being. They are:

> We already do not believe that the truth remains the truth, when the veil is removed... Today, for us, it is a question of decorum to not want to see everything naked, to be present to all, to understand and "know" all. "Is it true that God is everywhere?", a little girl asked her mother; "I do not think that is decent" – a sign for the philosophers!... We should have more respect for the decency with which nature has hidden itself behind enigmas and colorful uncertainties. Maybe the truth is a woman who has reasons to not let her reasons be seen? Maybe your name, to speak Greek, is Baubo?... Oh, those Greeks! They understood living! For that, it is necessary to remain valiantly on the surface, on the fold, on the skin, worship appearances, believe in shapes, tones, words, in all Olympus of appearances! (Nietzsche, 2001)

> Pero si el hombre quiere volver a encontrarse alguna vez en la vecindad al ser, tiene que aprender previamente a existir prescindiendo de nombres. Tiene que reconocer en la misma medida tanto la seducción de la opinión pública como la impotencia de lo privado. Antes de hablar, el hombre debe dejarse interpelar de nuevo por el ser, con el peligro de que, bajo este reclamo, él tenga poco o raras veces algo que decir. Sólo así se le vuelve a regalar a la palabra el valor precioso de su esencia y al hombre la morada

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> donde habitar en la verdad del ser (Heidegger, 2000)
>
> Le langage n'est pas fait pour être cru mais pour être obéi (Deleuze; Parnet, 1996)
>
> "When I use a word" – said Humpty Dumpty in a teasing tone – "it means exactly what I want it to mean, no more, no less."
> "The question is" – said Alice – "if you can make words mean so many different things" (Carroll, 2000).

Foucault (1984) exposes that the reason that drives him in his philosophical search is curiosity, making it clear that the only kind of curiosity that deserves to be practiced with a little bit of tenacity "is not the one that seeks to assimilate what is convenient to know, but the one that allows you to separate from yourself". This statement (which perhaps could be understood as a Foucaultian methodological "trace") is accompanied by an important question: "What would the tenacity of knowledge be worth if it only guaranteed the acquisition of knowledge and not, in a way, and as much as possible, the straying of the one who knows?" (Foucault, 1984, p. 13).

Such a question, as Foucault warns, leads us to consider the *levity* of human beings' effort to secure oneself in just a truth for the acquisition of (philosophical) knowledge, as well as of their rigor standards, usually based on a metaphysical seventh heaven. However, from Foucault's perspective mentioned above, we can state that the process of knowledge production proposes, in its own investigative exercise, a loss of oneself, as well as a suppression of truths and presuppositions – a loss of that identity and well-located in space-time self, who acquired enough knowledge to be able *to explain the world* under some criterion of truth. To think along with this restlessness makes us remember the anthropologist Jeanne Favret-Saada who, researching a witchcraft community in Bocage, in the west of France, considers that anthropology would only be possible if her project would lose itself in some adventure, where her truths and hypothesis, previously defined, were put to the test or even erased (Favret-Saada, 1977).

Considering that, for Foucault, the philosophical activity is *materialized* in a critical work about oneself instead of trying to legitimize what is known, we consider necessary to problematize: to what extent is it possible to produce knowledge under other aspects and fundaments that are not dominant?

We understand that, in a philosophical activity, there is a kind of *asceticism*, an exercise of problematization *in* and *through* thinking, henceforth practiced by Foucault in his *parrhesia*. In it, the philosopher problematizes that if there is something that makes telling the truth possible, it would be the freedom to think everything again, to suspend the act of thinking in its enclosure. Maybe that is why, in the words of Abraham (2011), "the craft of philosophizing is

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more than a job, than a profession, it is an attitude". Gaston Bachelard, who also inspired Foucault in his philosophical activity, feverously sustained that the causes of stagnation and even regression in the development of knowledge do not come from external obstacles given by the complexity of the phenomena, but from something he called *epistemological obstacles*. In his preposition, we can note that, in light of the real mystery, what we believe to know clearly obscures what should be known. Thus, when we are presented with something new, the spirit is never young, but instead "very old, because it is as old as your prejudices" (Bachelard, 2005).

Therefore, he will warn that there is no worse epistemological obstacle than assuming a truth as a guarantee, considering that the biggest enterprise in the production of knowledge is to strip ourselves of what we know in order to question the presuppositions of any truth we lean on. This *stripping*, attached to the *obstinate curiosity*, seems to allow a certain freedom as an activity of the *truth of being*, as proposed by Heidegger. This truth, however, needs to be understood as a movement of meaning (and, therefore, active), seen as, for Heidegger (2000), the truth of being is constituted in the *meaning* of its existence, where the *essence of truth* would be the *Original Meaning* that clarifies the being for the human.

Foucault (1999) questions if the exclusion role of the opposition of craziness and reason, or in a system of interdiction would not be analogous to the exclusion exercised by the desire for truth (Foucault, 1999). In other words, he asks if the desire for truth would not be arbitrary and compulsive at the same time, since it depends on a mistake to remain, to assert itself in institutional in the most general form of a desire for knowledge. With that, Foucault will conclude that the truth is nothing more than a human construct and, therefore, can only be measured in its context (or in its *regimen*) from the games that form it, through which it is modified and fragmented. However, it will be its use that will effectively determine the validity of the construct, although by *use* we have to consider a kind of *functionality* since what decides the success of a given construct of truth is its efficacy – which puts in practice a process of meaning.

This Nietzschean way of Foucault problematizing the conditions of the constitution of truth seems inspired by considerations such as:

> No, that bad taste, that desire for truth, 'truth at any cost', that teenage delusion in the love of truth – it bores us: for that, we are too experienced, serious, joyful, boiled, deep... We do not believe that the truth stays the truth, when you take off the veil... Today is, for us, a question of decorum to not want to see everything naked, to be present for all, to understand and "know" all (Nietzsche, 2001).

There would be a lot to analyze in a consideration like this since, for Nietzsche, the veil is the *naked* reality, which makes the world visible and, at the same time, the world itself in the

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eyes of those who see it. In summary, this will be how Nietzsche will restore metaphysics and, with the same gesture, free it, advocating for a universe that is totally exposed and freed from the experience of humans. This is because, for the philosopher, the fact that we consider the world conditioned subjectively does not mean, in any way, that an objective world is possible (Nietzsche, 2008).

We believe that such thoughts shift, definitely, the possibility of an objective conception of the world, having a direct impact on the notion of truth as permanent and immobile. For Nietzsche, the old metaphysics must be substituted by a philosophy of desire, the same desire becoming has for "essence" or, in other words, the transformation of life as an ontological and aesthetic phenomenon. Thus, there is no inversion, but a conversion that, through aesthetic maneuvers, transforms an instance that is supposedly hidden and kept secret in a transformative revelation, something that Bergson (2005) would call "continuous creation of unpredictable novelty" – a kind of Dionysian background of the world that fights to appear.

This revelation does not presuppose the invention of the veil, or its destruction, but, before anything else, an act of recognizing it as a layer that makes immanent shapes appear in the world. We could find here an attempt to answer the Foucauldian question of to what extent would it be possible to think another way, considering, as Gilles Deleuze says, that philosophy is a kind of line (escape?!) that slides in the horizon in perpetual movement, bringing in its constitution the difficulty of capturing the truth – since it (the truth) dodges, is versatile, mutant, ultimately, something that will never be captured. However, the same action of its mobility, as Nietzsche would say, reveals the truth as a kind of mistake without which no one could live.

At this point, it is worth mentioning: that we talk about a desire that chooses what it believes to be true in detriment to that which is false, but also a disposition of truth/mistake as an established system. With that, we could question what we are discussing in this essay: a desire for truth or a desire to know? Foucault will consider that perhaps, in the true/false pair, there is the knot of a desire to know that is characteristic of our civilization (western) and that urges us to seek something in the world. However, this duality – which, in its ideal form, is manifested as a tension between two floating and unfathomable terms – determines how to impose a desire, a manner by which it is believed that an owner of truth is confronted with the "mistake" of the other. It is at this moment that this desire is installed in a "power apparatus", establishing itself as an absolute reference and/or as a universal state (Deleuze; Parnet, 1996).

Deleuze (1968) will dedicate a whole chapter to problematize the different ways in which the dogmatic image of thinking assumes a moral condition of *good nature* and *willingness*, the second being based on the will of the thinker that seeks the truth and the first

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on the good nature of thinking – which would rightfully possess the truth. However, it all contributes to the fact that our perception of the world arrives *realized*, and processed according to some directives that Foucault calls *strata*, historical formations, positivities, or empiricisms. In the words of Deleuze (1986), these formations deal with sedimentary layers made of things and words – that is, of what is seen and what is said, the visible and the enunciable, but also the audible, of the surfaces of visibilities and fields of legibility, as well as contents and expressions (Deleuze, 2017). This is because there is a precedence of the enunciation regimens over the ways to see or perceive, a subtlety that remains veiled and that, despite not seeing it, its surfaces of visibility constitute non-discursive formations irreducible to an enunciation. The fact that there is a precedence of the enunciable is because the visible has its own laws, allowing it to be determined but never reduced: there will always be something that exceeds what was named in the language (that is, still in the words of Deleuze (2017), what can be seen cannot be said, and vice-versa, since the acts of seeing and saying differ in nature).

Let us remember, in summary, the philosophy of David Hume. According to the philosopher, there are two fundamental characteristics of human nature: inference (as belief) and artifice as creation, that is, belief and creation are the actions that make the subject as such. With that, Hume (2009) will infer the existence of something different in the not given, that is, something that surpasses the given and that allows the subject to assert more of what they know. We believe it is through this path that the questioning about the difficulty in saying the truth must be enunciated as a critical problem of subjectivity itself.

Thus, this allows us to question with what right the human being asserts more of what they know, in a way that the reflection of the subject makes belief and artifice as creation possible, utilizing abstract powers, considering that the subject is normative: they create general norms and rules for the enunciation of their truths so that these norms and rules start to operate, simultaneously, as true entities and true values that guarantee the veracity of the truths that standardize and regulate. However, it is worth highlighting that nothing escapes our knowledge so radically as the power of Nature, since it "cannot be studied scientifically, but in its effects on the spirit" (Deleuze, 1993).

Therefore, the *empiricism* of Hume, so-called by Gilles Deleuze, moves along the Möbius Band, where one *side* (if we can call it that) is Nature and the other is the Spirit. It is in the movement of one under the other that we are not able to distinguish them in its *nature*, nor is it in its *effectuation*. It is worth highlighting that the concept of *nature*, in Hume, refers to the intention of including *human sensibility* in the continuous movement, considering that the world reaches us through the senses and accesses the spirit in the form of an image, which is the result

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of ways to perceive and process information. However, this does not give empiricism the status of a "philosophy of the senses", since, as stated by Deleuze (1993, p. 124), "empiricism is a philosophy of the imagination, not a philosophy of the senses". In general, a statement such as this leads us to think that the sensations are not limited to the senses, but produce images that continue operating in our perception until they reach what we call, with reason, imagination.

From here on, we can ask: how is it possible that the senses are considered, to a certain extent, distant, when they are the *only* vehicle of passage to the perceived?

The question might seem strange when we think that we start from the difficulty in saying the truth and, suddenly, we find ourselves inside Hume's empiricism questioning the function of the senses and of the imagination in what is perceived. However, if we consider that the artifice of creation produces necessary conditions with which Foucault takes the truth, the construction of the truth, and its acceptance/dissemination/rejection as kinds of crystalized products originated from/engendered to discursive practices, we understand that the human capacity of naming what exceeds, unfolds in the creative potential of their imagination, it allows the thinker to present the world in its permanent change, certain that under this change is the aegis of truth.

Considering this, the desire for a truth about the world creates subjection of its production from power, which, according to Foucault (2018), will be characterized as the foundation of relations of dominance. The current character of this discussion is in the consideration that, in our times, the ways of existence are lined by productivity, which is characterized by the hegemony of intellectual work[1]. Negri e Hardt (2004), for example, will call this era we live in the era of cognitive capitalism, a term that can be interpreted as a *third* capitalist transition that occurs after overcoming manufacturing and the development of the big industry. The originality of the cognitive capitalism consists of capturing, within a generalized social activity, the innovative elements that produce value.

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2.1 Intermezzo[2]

[1] The relations of knowledge production and, consequently, Mathematics, with productivity and hegemony of intellectual work has been a theme in many studies in Mathematics Education, highlighting (Baldino, 1998; Cabral; Baldino, 2022; Roque, 2021; Roque; Giraldo, 2022; Souza; Flores, 2022).

[2] The Parts In Quotation Marks That Compose The (Multi)(Di)Alogue Were Extracted Literally From *Twilight of the Idols,* by Friedrich Nietzsche, more specifically from the aphorisms 1-12 that compose *The Problem of Socrates* (Nietzsche, 1998, p. 11-15). Italics by the author.

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— **“**Throughout the ages the wisest of men have passed the same judgement on life: it is no good... Always and everywhere their mouths have been heard to produce the same sound— a sound full of doubt, full of melancholy, full of weariness of life, full of resistance to life. [...]”.

— “What does this prove"? What does this point to?”.

— “There must be at least something true here! The consensus sapientium* proves the truth.”.

— “Shall we still speak in such terms today? Can we do so?”.

— “I recognized Socrates and Plato as symptoms of decay, as tools of the Greek dissolution, as pseudo-Greek, as anti-Greek. [...] That *consensus sapientium* — I have realized it more and more — proves least of all that they were right in what they agreed on: it proves rather that they themselves, these wisest of men, were somehow in *physiological* agreement in order to have — *to have* to have — the same negative attitude towards life. Judgements, value judgements on life, whether for or against, can ultimately never be true: they have value only as symptoms, they can be considered only as symptoms — in themselves such judgements are foolish.”.

— “I am seeking to understand what was the idiosyncrasy which gave rise to that Socratic equation, reason = virtue = happiness: that most bizarre of all equations which, in particular, has all the instincts of the older Hellene ranged against it.”.

— “With Socrates, Greek taste switches over in favour of dialectics: what is actually going on here? Above all it means a *noble* taste is defeated; with dialectics the rabble comes out on top. Before Socrates, dialectical manners were disapproved of in polite society: they were seen as bad manners because they were revealing”

— “You choose dialectics only when you have no other means. You know that using it provokes mistrust, and that it is not very convincing.”.

— “Is Socrates' irony an expression of revolt? of the rabble's resentment?* as one of the oppressed does he enjoy his own ferocity in the knife-thrusts of the syllogism? does he *avenge* himself on the noble men he fascinates?”.

— “As a dialectician you have a merciless tool in your hand; you can play the tyrant with it; you reveal by conquering. The dialectician leaves it to his opponent to prove he is not an idiot: he infuriates him and makes him helpless at the same time. The dialectician disempowers his opponent's intellect. —What? is dialectics just a form of revenge for Socrates?”.

— “And Socrates understood that the whole world *needed* him—his method, his cure, his personal trick of self-preservation... Everywhere the instincts were in anarchy; everywhere

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people were a few steps away from excess: the *monstrum in animo* was the general danger.".

— "The drives want to play the tyrant; we must invent a *counter-tyra*nt who is stronger".

— "If it is necessary to make a tyrant out of *reason*, as Socrates did, then there must be no little danger that something else might play the tyrant. At that time people sensed in rationality a *deliverance'*, neither Socrates nor his 'invalids' were free to be rational—it was de *rigueur*, it was their last available means. The fanaticism with which the whole of Greek thought throws itself on rationality betrays a crisis: they were in danger, they had just one choice: either perish or—be *absurdly rational*. . .".

***

From this diffuse yet essayistic epistemological turn, we return to a discussion raised by us, a while ago, about the "rigor" being or not being something existent – or that which constitutes a discursivity within Mathematics (Gondim; Gomes, 2016) (discursivity engendered to the veracity and ways to validate that which is practiced in the mathematical territory). We chose this unfolding, also essayistic, due to being submerged in these discussions for some years and, above all, due to currently being thinking about statements such as:

> Those who seek the just path of truth should not deal with any object of which they cannot have the same certainty as the arithmetic and geometric demonstrations (Descartes, s.d.)
>
> Geometry and logic are rigorously applicable to matter. They feel at home in it, they can walk by themselves. But, outside of this area, pure reasoning needs to be overseen by common sense, which is something quite different (Bergson, 2005)
>
> The "truths" are demonstrated by their effects, not by logical proofs, but by the test of force (Nietzsche, 2013)
>
> Intuitive is the opposite of rigorous. Even this use of the words is not completely clear, since the meaning of "rigorous" is never given precisely. We could say that, in this sense, intuitive means lacking in rigor and, however, the concept of rigor is defined intuitively instead of rigorously (Davis; Hersh,1986).

Thus, having difficulty in saying the truth as the focus and supported by a kind of archeological movement operated in a delimited territory of knowledge, we question: under what aspects and circumstances a truth is constituted as such in Mathematics? What diagrams extend the discursive dimensions of the truth in Mathematics? Which lines of force are pulled when we ask about the functioning of truth in Mathematics? Our path will certainly remain aligned with the thinking of the anthropologist Favret-Saada (1977): what we propose is only possible if we lose ourselves in some adventure(s), in which every and any truth we carry is put

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to the test at all times – when not erased, in the best hypothesis.

3 Second act: paradoxes and war machines

> There is a barber in a village who shaves everyone who does not shave themselves and only those. Who shaves the barber? If he shaves himself, then he does not shave himself, but if he does not shave himself, then the shaves himself (Blackburn, 2007, p. 320).

The known barber *paradox*, a variant of the Russell Paradox, is wedged in the logic of the analytical philosophical thought and follows from what Hilbert would call "logical paradise" created by Cantor, that is, by the affirmation that "everything is together". Thinking of this paradox brings to memory the principle of the excluded third, that is, if the barber shaves himself, he will belong to the group of people who shave themselves, however, he will never shave people, since he belongs to the group of people who shave themselves. Therefore, the barber cannot shave himself. On the other hand, if other people from the village shave the barber, he (the barber) belongs to the group of people who do not shave themselves but shave everyone, so he shaves himself. It is concluded, by *definition*, that this barber does not exist.

It is important to clarify that our interest in this essay does not couple with the mathematical repercussions that the Russell paradox created in Modern Mathematics and neither with the conditions that support its construction. We will use the paradox only as a device to problematize the organic classifications of the masculine noun *rigor* – intimately related to the paradoxical barber who is, apparently, inexistent.

When we refer to the organic classifications, it is worth highlighting that it refers to the Mathematical organization, that is, to some organs of the legitimacy of the affirmations in Mathematics. Still, we highlight that, in this second essayistic act, what makes us ramble are concerns about definitions, theorems, and demonstrations. That is, assuming that the rigor is the barber, let us consider two lines: (A) if he belongs to the group of those who shave themselves, he shaves himself. However, he will not be the barber, since he belongs to the group of those who shave themselves. By definition, the barber cannot exist. (B) If he belongs to the group of those who do not shave themselves, but shaves the barber, he shaves himself, since he shaves all of those who do not shave themselves. Again, by definition, the barber cannot exist. What do we want to say with (A) and (B)? What conclusions do we want to reach with these two hypotheses? Actually, before wanting to finish off this essay with a beautiful *cqd* (as we wanted to demonstrate), we invite the reader to see what happens *between* (A) and (B).

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Knowing that the people cannot shave themselves demands a barber, and not any barber, a barber who only shaves this kind of people. A barber who lives shaving people who cannot trim their own beard, and only those. For what use is a barber to someone who is able to shave themselves perfectly and dexterously? Yes, the village needs this kind of barber, who shaves those who are unable to shave themselves. But, let us see: if he shaves only those who are unable to shave themselves, he cannot shave himself – he knows how to handle the razor well! But a barber who does not have a well-trimmed beard would give a bad impression to his clients, right? Who shaves this barber? Who gives him a polished and confident appearance so that the clients who subject themselves to his razor can leave the chair satisfied? Invoking the rigor and making it possess this enigmatic barber, what we ask is: if the rigor shaves those who do not shave themselves and only those, who shaves the rigor? To what power does the rigor surrender? Who or what subjectifies the rigor?

Speaking of rigor, perhaps it is necessary to highlight, to confront our concerns, three concepts of mathematical rigor raised by the researcher René Thom (1986). According to the author, there are three possible attitudes of mathematical rigor, which are: the *formalist concept*; the *realist* or *platonic concept*; the *empiric* or *sociological concept*. In general, according to Thom (1986, p. 120), the formalist concept of mathematical rigor is grounded on the idea that "a proposition (P) is true in a formalized system (S) if it can be deducted from the axioms of (S) through a finite number of valid operations in (S)". While the realist or platonic concept assumes that the mathematical entities exist independently from our mind. That is, "a proposition (P) is true when it expresses an effectively existent relation between the ideas, that is, a hierarchically superior idea that structures a set of ideas subordinated to it". Lastly, the empiric or sociological concept of rigor considers that "a demonstration (D) is considered rigorous if the best specialists in the subject do not have anything to oppose".

At this point, we encounter something interesting: in the first concept, brought by Thom (1986), the term *valid propositions* makes us question: valid for who? This concept carries an image of rigor that needs to pre-establish which operations will or will not be considered valid, *a priori*, in a way that the mathematician can make use of them. And here, a question: who validates these operations? In the second concept, we see something similar happen, that is, there is the need for something *hierarchically superior* that precedes any and every rigorous practice – that is, again, the idea that an invisible being who is omnipotent, who sees all, controls all and who is capable of defining what is or not a superior idea. Lastly, for the third way to understand rigor, we ask: who defines who is the best? What criteria are used to define which opinions will be considered in the moment of analyzing a demonstration?

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In this path, in a very *irreverent* manner, it seems to us that the three concepts do not differ, referring us to the same *locus*, to the same in-between – a non-place, or even a non-being. *Who* or *what* validates? In which territory are we entering (or, from which are we leaving) in the moment when we try to answer this type of question? With what lines of force are we dealing with when focusing our gazes on this knot in the network on which all ideas of rigor brought by the mentioned author and that are largely used in the mathematical-academic context seem to converge?

To consider the formalist concept of rigor, as can be seen in the previous lines, is the same as saying that a proposition is true if there is a formalized system with axioms and operations to which this proposition is subjected for analysis of validity within the system. That is, the rigor is the formalized system and the proposition is validated from this system, this rigor. But, in this case, who or what validates the formalized system? The rigor is shape or is it shaped? Or even, who or what trims the hair of the rigor? What *gives rigor* to the rigor? For, it makes rigorous all which does not give rigor to itself, it gives rigor to itself, that is, it is not the rigor. But if it belongs to the group of those that give rigor to themselves, then it does not give rigor to the group that does not give rigor to itself, then it does not give rigor to the group that does not give rigor to itself, since it gives rigor only to itself – again, it is not rigor. *Where is the rigor-barber?*

If we consider the realist or platonic concept of rigor, it will be assumed that the mathematical entities exist independently from the mind, that is, any proposition will only be true when establishing a relation between the ideas with another superior idea. One idea that structures the ideas subordinated to it. In this concept, the lesser ideas are subordinated by the greater idea. The legitimacy of the lesser ideas is conditioned to the relation with the greater idea. However, who or what makes the mathematical entities exist in their rational infallibility? To whom or what does hierarchically superior idea relate to? What happens with the lesser ideas when they are not legitimized by the greater idea? *Where is the rigor-barber?*

On the other hand, if the empiricist or sociological concept of rigor is considered, we assume there are people, the best in the field, who, looking at what is being presented for legitimization, will give their final word regarding the validity of the proposition. That is, in this case, what matters is the eye of the beholder. Will it be the mathematician (or group of mathematicians) who, armed with their tools and wearing their priestly robes, will say with their voice of authority if the proposition being analyzed is or not true? With that, the proposition is subjected to the objectivity of the eye of the beholder. Only the demonstrations of truth that, before passing the line imposed by the gate, are legitimized by the angels of faith

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will enter the doors to the rigorous and structured palace. Those responsible for order, peace, and regularity. Those subjected to vast training of looks, bodies, and minds, which makes them capable of protecting the borders of the kingdom – or, as highlighted by Lins (2009), those who are able to caress, without fear, the pet monsters in the mathematician's backyard.

Again, following this line, we ask: where is the rigor? In the eye of the beholder? In the tools and robes that serve as filters? Who or what guarantees the validity of this gaze? What shape is the eye of the beholder? Who or what trims the barber's beard? Who gives orders to the angels? Who requires their presence and who molds their attitudes in front of the palace gates? Who feeds the monsters so that they stay alive? *Where is the rigor-barber?*

Note that in every situation in which we ask *what is the rigor?* we fall into the barber paradox. Thus, the rigor is betrayed by its own essence. By its own identity. By its substance. By its rigidity. It is deformed by its form, by the matter that composes it. However, what happens when we warm the rigidity of the rigor and make its particles frenetically clash against each other?

Considering that the search for the rigor in its essence leads us to a paradox of inexistence, that the desire for truth that supports the veracity of what is true captures us and fixes us on an inclined chair waiting for a barber we know is there (but who is not), we try to rephrase the question: *what rigor?* With that, we give our questions and concerns to another plane, that is, to the plane of happenings: *what rigor happens?*

In the third act, we will comprehend that questioning this does not imply affirming an *inexistence* of rigor, but, on the contrary, considering it as something that occurs in the interior of discursive practices of doing mathematics, that is, as something that is enunciated in its practice (or in its exercise) counterpointing its deference as an *a priori* and universalizing determination. That is because, as argued by Giraldo and Roque (2021, p. 3) "in contemporary mathematics, the perfection of the structure, approved by the rules of logic, is pursued in the form of organizing and linking axioms, definitions, theorems and demonstrations, which constitutes the guarantee of correct and accurate results".

4 Third Act: rigor-happening and lines of escape

Before we begin the exercise of considering the rigor as happening, we would like to talk about some *entities* and/or *mechanisms* and/or *devices* that are used in mathematical territory, which are: *definitions, theorems,* and *demonstrations*.

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First, we will discuss demonstrations: in several Portuguese dictionaries, the idea of demonstrating relates to explaining – explaining to prove, to convince, to persuade, to legitimate, to prove as true. Reveal, make seen – a manifestation of the essence. However, more than that, some may say that:

> It would not be a reach to say that there is no Mathematics without demonstrations; they are part of the *essential* logic structure from what Mathematics is constructed and *how it works. The demonstrations are like indispensable rituals, used to prove results, guaranteeing that they are valid* (Filho, 2014, p. 101, our highlight).

With that, we can understand that demonstrating operates as an act of persuasion, of logical-deductive thinking, of convincing that something is valid, true and it is observed that "it is as if the writer [who demonstrates] were to guide a friend through a road of which this friend knows the 'beginning', which are the hypotheses, and the 'end', which is the thesis" (Filho, 2014, p. 102). In the demonstration, the act of demonstrating is intrinsic, that is, if there is a demonstration, there is the subject of the demonstration (that is, the one who demonstrates). This subject does not play, they only want to legitimate and, through logical-deductive thinking, want to persuade that something is true in a plane of operations – be they valid in a formalized system of finite operations of the system itself, in a relation of lesser ideas hierarchized by greater ideas or in the experience and the power exercised by something or someone. In other words, demonstrating is not playing hide-and-seek (Filho, 2014).

When talking about demonstration, Garnica (1995, p. 10-11, our highlights) corroborates that it is

> [...] what attests the veracity or authenticity, the guarantee, the testimony, the process of verification of the accuracy of calculations or thoughts, the deduction that keeps the truth of its conclusion supported by premises admitted as true. […] The routine discourse and activity of the scientific practice of Mathematics claim to recognize the proof (or rigorous proof, or demonstration) as *central element* in the development of what we know as Mathematics […].

Thus, once more, we observe that demonstrating is attesting veracity, guaranteeing; verifying accuracy; deduction that keeps the truth; the central element and essence of Mathematics. We note that the demonstration seems to be attached to a search for the truth, a process of authentication. As highlighted by Serra (1995, p. 7), "[...] the demonstration is a calculation in which, given the premises, we are forced to accept the conclusion"[3].That is, if we want to say something is true, in Mathematics, we need to demonstrate that it is a fact, through

[3] Considerations such as this are problematized by other authors from the didactic point of view, from which we highlight those who "flexibilize" the comprehensions of the demonstration's concepts in search of a less static and uniform comprehension (Balacheff, 1987; Pietropaolo, 2005; Silva Dias, 2009).

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facts. The demonstration happens as an instrument of legitimation, or better yet, as a practice of arguments that attest the truth of a proposition. A ritualistic practice.

Despite the controversies presented in Mathematics Education when assuming the demonstration this way, as well as the different ways to comprehend it (Batista; Nagafuchi, 2010; Garnica, 1995; Matheus, 2016; Pietropaolo, 2005), we understand that its history and/or archeology is not, *ab origine*, the central object of this discussion, but instead a subject that it produces and evokes while enunciation of the truth. Therefore, we move towards this subject to then consider that the rigor is not that which non-exists, as the barber, but that its existence occurs in a discursive practice that the demonstration is a part of the process of guarantee and acceptability of a certain truth.

The demonstration being a *central element*, a little contact with Mathematics is enough to understand, in general, what that means – as reports Burgess (2015, p. 3-4), who highlights that mathematicians are not equipped to provide "a precise theoretical description of the nature of rigorous proof. Nowadays, they rarely try to do it anyway. Most mathematicians seem to be rigorous in the same way that Judge Stewart defended obscenity", referencing the case in which Judge Potter Stewart, from the Supreme Court of the United States, in 1964, when analyzing videos denominated hard-core pornography, said that even if he could not define what those videos were, he knew that the videos under analysis were not that; that was when the phrase "*I know when I see it*" became quite well-known.

Thus, we could say that the demonstration seems to emerge as a discursive strategy that enables the guarantee of a universal truth and the enunciation of a subject of truth, simultaneously[4]. Otherwise, the relation between the mathematical professionalism and the constitution of what is called the Mathematical Fundaments for some and Philosophies of Mathematics to others would be accidental (Costa, 1992; Silva, 2007). That is because, as highlighted by Lins (2009, p. 97-98, highlights by the author):

> [...] it was only from the 19th century that *mathematicians* engaged in a debugging process of their professional field, their profession, in order to free it from all that was *extra-systemic*, that was "outside" of the mathematicians' Mathematics. […] What occurred, in fact, was a movement that sought to free the mathematicians'

[4] Roque and Giraldo (2022, p. vi, italics by the authors), when problematizing the constitution of this universe, argue that the universalism of Mathematics as ruling science is overly permeated by a cartesian perspective of the world, where "the proposition of a *universal science,* as a privileged way to understand everything that is possible to be understood [...] is, in truth, the institution of a *universe*, outlined by what can be understood through mathematics, of quantifiable things and the relations among them". Problematizing the invention of this universe constituted so that subjects live in it in centuries following cartesianism is something that can be found in texts such as Pessanha (1997), Lins (2009), Roque (2021) and Gondim (2023), where the interest for a universe guided by objectivity and accuracy occurs along with the production of a rationality that marks other possibilities of existence under the aegis of a hegemonic subject.

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> Mathematics from everything that referred to the intuition of the physical world, not as way to reach the truth, but as a way to guarantee who could talk about the subject.

Considering the words of Garnica (1995), it makes us think, again, that for there to be a demonstration, that is, for the verification and validation of a certain theorem to be constituted, the validating gaze of the one who will brandish the pen whose ink will attest and perpetuate something as legitimate and true is necessary. That is, the demonstration, in action, evokes simultaneously a *subject of demonstration*. With that, the structure, the procedures, and the rules are unique to this exercise.[5]

In this sense, we understand that this argumentative exercise is not limited only to its writing, its structure, its rules, or the speech of the one demonstrating, but to the discursive practices that the subject assumes to validate what is being proposed as something that aspires to the truth. Therefore, when we put aside the demonstration as a *central element* when we move from the center to the margins, it is possible to perceive the demonstration not as essence or essential for Mathematics, but as practice, which *happens* in the act of validating. We mean that "the rigorous proof [the demonstration] is taken as a formative element of the mathematical *discourse* […]" (Garnica, 1995, p. 11, our highlight).

Thus, the demonstration shapes the mathematical discourse but is itself shaped by something that seems to surpass the limits of its own body, which goes beyond the lines that constitute it as a tool of truth and inserts it in the sphere of practice that inaugurates discourses while being itself a *discursive* practice. That is, the statement being a regimented communication act and with pretension to the truth (Dreyfus; Rabinow, 1995), the discourse refers to the set of statements that obey the common functioning rules, that is, the discourse

[5] Here, we can widen the discussion by thinking that "different notions of rigor usually correspond to radically different ways to understand Mathematics" (Bottazzini, 1986, p. 4,) – which connects to the discussion woven in our second act, that is, the idea that the mathematical truth is linked to the method used to attest its veracity. Historically, we see that there were several points in which the mathematical rigor leaned: geometry, analysis, and arithmetic, for example. Roque and Pessanha, already mentioned here, when discussing the dispute between humanities and hard sciences, point out that fields that use mathematics are seen as more rigorous to the detriment of other fields, such as philosophy or sociology. Thus, Mathematics becomes designated to "guarantee legitimacy to other fields of knowledge" (Roque, 2021, p. 60), after all, it is "a high coagent discourse" being able "to rule with the force of an authority and even authoritarianism" (Pessanha, 1997, p. 15). However, thinking historically, it is possible to note that "precision, accuracy, rigor or objectivity are notions whose meaning changed with time" (Roque, 2022, p. 60). Thus, the separation between hard sciences and humanity sciences considers the supremacy of hard sciences, but also misses a primordial factor: without language, nothing would have happened (Cabral; Baldino, 2022). According to the aforementioned author, "this sedimentation of the hard sciences is tied to the teaching institutions and to the production of knowledge created in France after the revolution" (Roque, 2022, p. 62). Due to the mistrust in oral language, after the creation of Normal School, in 1795, "the same rigor [read the analytic method] of the hard sciences should serve science and politics" (Roque, 2022, p. 62). As a note, there is no need to essay more. The mathematical rigor becomes a part of politics and serves the power explicitly as a universalizing rationality (Gondim, 2023; Roque; Giraldo, 2022). Going back to the beginning of this note, we can conclude that "the notion of rigor is historic" (Roque, 2012, p. 405) and, consequently, this *subject of enunciation* is also historic and intimately related to the discourse.

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would be "a set of statements, to the extent in which they are grounded in the same discursive formation" (Foucault, 2015, p. 143). As we said before, in the words of Foucault (2000), a set of rules is characteristic of discursive practices.

But then, what would be a discursive practice? Would it be a practice of rules and principles? In Foucault (2015, p. 144), a discursive practice is characterized as "[…] a set of anonymous, historical rules, always determined in time and space, which defined, in a given era and for a given social, economic, geographic or linguistic field, the exercise conditions of the enunciative function.". In this sense, demonstrations as a criterion of validation for theorems, for example, emerge in the midst of discourses about how to validate theorems, and appear linked to discourses that *already* occurred, since "all discursive formation is a kaleidoscope of objects that appear and of objects that disappear" (Foucault *et al*, 1971, p. 104). The question that emerges is: what makes a certain validating object that appeared remain? What forces act on such an object so that all others disappear and make it (the object) stay and crystalize?

Searching for answers to these questions leads us, again and in a much more *intensive* way, to a search for the subject that is evoked in the discursive exercise of demonstrating something in Mathematics. In this sense, it is important to ponder a few things, since, according to Araújo (2007, p. 7-8), "the subject of the discourse is not the person who performs a speech act […], the subject is the one who can use a certain enunciative act due to their training, their institutional position or technical competence.". However, the subject of the discourse is not the discourse itself, it is something that makes it disseminate, something that, capable, reinforces the discourse through practices, perpetuating it. It is an arm of the discourse, one of its tentacles that smooths territories so that they are striated with discourses that support it. In the words of Foucault, the discursive subject

> […] is a determined and empty place that can be effectively occupied by different individuals; but this place, instead of being defined once and for all and staying uniform throughout a text, a book or work, varies – or better yet, it is variable enough to be able to stay, identical to itself, through several phases, as well as to change at each one. This place is a dimension that characterizes all formulation while statement, constituting one of the traits that belong exclusively to the enunciative function and allow it to be described (Foucault, 2015, p. 116).

Thus, the subject of the discourse is a variable place waiting for something that occupies it – more importantly, it is something that derives from the discourse itself, from the statement itself.

Taking this thought in the direction we have been discussing about rigor and assuming the *rigor statement*, we can say along with Deleuze (2017) that this statement (as well as all

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statements) is a kind of primitive function (idea very close to the Differential and Integral Calculus), from which the subject that gives rigor – that is, the subject that demonstrates, the subject of the rigor statement – is its derived function. A function that becomes a place to be occupied, that tenses forces that occupy and activate an entire rigorous device characteristic of the subject that gives rigor to that which is deprived of rigor. A subject of rigor that derives directly from the rigor statement.

Therefore, going back to the analogy with the barber paradox and the *rigor-barber* relation, we can think that, in a discursive territory (of discursive practices, of pure happening), they all use the same garb. Furthermore, we understand that it is impossible to dare change since it would all be visible to everyone's eyes. There, in the order of happening, everyone uses even the same shave. But, if they are shaved, the barber exists and we need to include him here – however, not as essence, but as *happening*. A barber that exists because he happens.

A barber who shaves everyone in the village. But, why does he tend to not exist? What is wrong is how we ask: we should not look for the essentiality of the rigor, for the subject that *rigorizes* from a previously established identity; we need to think of rigor, as we said a few times, as that which happens, as practice, in the order of happening. What we see as being rigorous, as having a rigorous *identity*, is nothing but a vestige, leftovers, crystalized dispatches from a rigor happening that only gives rigor to the extent in which it is in operation, in action, and that disappears completely when the happening stops.

Those who occupy the variable place of discursive subject of rigor are members and practitioners of an institution. They exercise discursive practices in order to crystalize mathematical discourses. An action that happens in the (discursive) *relations.* However, it is not about a hierarchically greater, superior idea, of the cause-effect kind, but a relation of power. So the rigor as discourse (as a discursive practice, as happening) can be understood, not by demonstrations, theorems, or definitions, but by the relations of power that are established along with these *capture devices* of the territory in which the rigorous discourse is valid, turning it in a kind of *Rigor-state* (Gondim, 2023; Roque, 2021; Roque; Giraldo, 2022).

This is intensified when we think about the *objects of discourse* since it is not by the objects per se that the unit of a discursive form is given, which continuously transforms, but by *a set of relations* that allow the presence of or exclude certain objects. "And as these relations are external to the discourse, but adhere to it as a condition of possibility, we can say that the objects of discourse are constituted by the discourse itself" (Foucault *et al*., 1971, p. 104). Again, just as the discursive subject, the object of discourse also derives from the rigor statement, any rigorous object also derives from the rigor itself. Subject and object, which

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support any rigorous act as such, are nothing but places to be occupied discursively by someone or something that will be stamped by the function exercised in the functional relation of power that rigorizes.

All of this leads us to conclude that the barber shaves himself *and* shaves those who cannot shave themselves – simple as that. He does not exist due to his essentiality (otherwise, his existence would demand his inexistence), but due to the discursive practices that make him appear and disappear. A barber who is to the extent that he happens, a barber who is in constant becoming and who is produced by the rigorous discourse itself. *Rigor-becoming-happening*. Thus, a new paradox emerges: the rigor just happens, and the rigor just allows things to be crystalized and identified as rigorous per se because it is moving among a set of relations of power that make this rigorous territory a moving place, *being* as *the* meaning of the *truth of being.*

To conclude (with a snapshot in this infinite flow of possibilities), we ask: what happenings make this rigor appear and disappear? Which discourses support it as a discursive practice that dominates and imposes and subjects several actors to use their techniques in detriment to being discredited (in the academic field, mainly)? Which discursive practices harden the malleable tentacles and camouflage them behind these well-interlaced bindings? Why this rigor and not another? Is there really this rigor, the rigor (accompanied by definite article) or are what we have rigors, the most varied possible, which wear their capes of equivalence and similarities in order to camouflage in the veil that covers reality? Which powers establish this rigor and not another? Are what we have discourses of rigor or discursive rigor(s)?

We see that this rigor (the rigor of/on the occurrence) operates antagonistically to the will of truth, since, instead of seeking to distinguish what is true from what is false, what can be considered rigorous in detriment to what is devoid of rigor, this rigor-happening, more than a human construct, is measured through its use; being what effectively determines the validity and rigorousness of what is being constructed. When compared to the barber paradox, this way of understanding rigor challenges the being and not being, crossing the truth through the middle and creating a rift in which human sensibility lives. In this rift, the mathematical rigor is close to a kind of empiricism, that is, a philosophy of the imagination (Deleuze, 1993). Therefore, what is at stake is not the existence of the barber on the logical paradigm presented, but their conditions of existence as something that happens as a discursive practice, thus evidencing the production of a subject (also discursive) in the interior of each practice.

Such rigor, as stated by Bergson (2005), would allow continuous creations of unpredictable novelties, relocating the truth in that place in which it could not be fully captured,

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regardless of the rigorous system to which it is subjected. This rigor is devoid of a previous rigorousness, seen as it does not presuppose an existential and essential *a priori* (like of an absolute truth) and, thus, it is unaccompanied by a definite article (instead of *the* rigor, just rigor). Therefore, it is a rigor that is able to find an escape line and build a hospitable place, a pleat on the outside line, expressing itself as possible cartography in the production of knowledge (LEVY, 2011), untangling from truths that enunciate as absolute and uncontestable and from power relations, even if for brief moments.

In other words, it is a rigor without organs as enunciation of a problematized body that does not deny its organisms (such as demonstrations, theorems, axioms, etc.), but the organization made of them, that is, it is worth only this way (Gomes, 2020). In other words, it refers to understanding the production of mathematical knowledge breaking the possibility of saying the truth, and assuming the power of its problematization as a happening (Giraldo; Roque, 2021).

That is why we have difficulty saying the truth.

5 Anti-Epilogue

— What is Jazz, Mr. Armstrong?

— My dear lady, as long as you have to ask that question, you will never know it (Lima, 1976).

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