# MICHEL FOUCAULT AND THE TEACHING OF PHYSICS: SIDEWALKS

**Marcello Ferreira**[1]
Universidade de Brasília – UnB – Brasil
marcellof@unb.br

[1] Professor do Instituto de Física e do Programa de Pós-Graduação em
Ensino de Física da Universidade de Brasília (UnB).

**ABSTRACT:** Michel Foucault is undoubtedly one of the most important and consecrated thinkers of all time, especially for his contributions against order. His work has unique characteristics, either by its conceptions and its methods, or by the way of approaching, in historical-philosophical perspectives, foundational themes of social life. This article seeks to present and problematize Foucault's theoretical perspectives, especially in the domains of knowledge, power and ethics, articulating them with possible fields of research and practices in physics teaching. We do not propose a method or a manual for the application of Foucault in themes of research/teaching in physics. However, a *new way of looking* is proposed, necessary for a new way of teaching.

**Key-words:** Foucault. Physics teaching. Teaching. Physics. Education.

**RESUMO:** Michel Foucault é, sem sombra de dúvidas, um dos mais importantes e consagrados pensadores de todos os tempos, especialmente por suas contribuições contra a ordem. A sua obra tem características únicas, seja por suas das concepções e por seus métodos, seja pela forma de abordar, em perspectivas histórico-filosóficas, temas fundantes da vida social. Este artigo busca apresentar e problematizar perspectivas teóricas de Foucault, especialmente nos domínios do saber, do poder e da ética, articulando-as com possíveis campos de pesquisa e das práticas em ensino de física. Não se propõe um método ou um manual para a aplicação de Foucault em temas da(o) pesquisa/ensino em física. Propõe-se, entretanto, um *novo modo de olhar*, necessário a um novo modo de ensinar.

**Palavras-chave:** Foucault. Ensino de Física. Ensino. Física. Educação.

**RESUMEN:** Michel Foucault es, sin lugar a dudas, uno de los más importantes y consagrados pensadores de todos los tiempos, especialmente por sus contribuciones contra el orden. Su obra tiene características únicas, sea por sus concepciones y por sus métodos, sea por la forma de abordar, en perspectivas histórico-filosóficas, temas fundantes de la vida social. Este artículo busca presentar y problematizar perspectivas teóricas de Foucault, especialmente en los dominios del saber, del poder y de la ética, articulándolas con posibles campos de investigación y de las prácticas en enseñanza de física. No se propone un método o un manual para la aplicación de Foucault en temas de la investigación/enseñanza en física. Se propone, sin embargo, un *nuevo modo de mirar*, necesario para un nuevo modo de enseñar.

**Palabras clave:** Foucault. Enseñanza de Física. Enseñanza. Física. Educación.

# 1 INTRODUCTION

**Figure 1 - The treachery of images (this is not a pipe)[1]**



Source: Magritte, 1929.

The actuality of the themes worked by Foucault (who lived between the years 1926 and 1984) is something that calls attention and can only be better understood in the course of time and in the detailed assimilation of his work.

An important part of his bibliographic production was made in the 1960s (History of Madness, Words and Things, and The Archeology of Knowledge) and 1970s (The Order of Discourse, Truth and Juridical Forms, Discipline and Punish: the birth of the prison, and the first volume of The History of Sexuality – The Will to Knowledge). This in order to, at the risk of the reduction that every synthesis promotes, stay in those works of greater academic and critical impact.

The last volume of *The History of Sexuality* (whose subtitle is Confessions of the Flesh), for example, was only published in February 2018 in France. Part of his work on *Biopolitics, Biopower and Governmentality* was published in Brazil only in 2014. This corroborates the actuality of a work that, produced in the 1980s (or even earlier), remains relevant to philosophical discussions in the 21st century.

---

[1] The work "The treachery of images", by René Magritte, inspired Foucault to write the book "This is not a pipe" (FOUCAULT, 2014a). In that text, the philosopher performs a humorous and ironic but at the same time profound and instigating analysis that problematizes the relation between image, reality and representation. The idea of 'real' derives from idealism, "a philosophical conception according to which there is an external reality, determined, autonomous, independent of the knowledge one can have about it. True knowledge, in a realistic perspective, would then be the coincidence or correspondence between our judgments and this reality [...] When certain idealistic philosophers ask themselves about the reality of the outside world, they are wondering if the world possesses an effective existence external to our thinking or if it is only a set of representations of our thinking" (JAPIASSU; MARCONDES, 2006, p. 162).

There are many attempts to thematize, affiliate, categorize and link Foucault. Although his work is, chronologically and substantively, associated with domains (VEIGA-NETO, 2014) about being-**knowing**, being-**being** able and being-with-oneself (**ethics**), according to Morey's (1991) ontological organization, it is Foucault himself who centralizes subjectivity – and, more than that, the search for a free subject – as the object of his historization and philosophy.

In *The Subject and Power*, Foucault (2007, p. 1) states: "My purpose was not to analyze the phenomenon of power, nor to elaborate the foundations of its analysis, on the contrary, my objective was to elaborate a history of the different ways in which humans are constituted in subjects".

Still on the attempt to label Foucault's work, Bourdieu pointed out that:

> Without attempting to unveil my intuition about what might be the "central intuition" of Foucault's work, in an attempt of appropriation by which all the great works are objects, I would like, while evoking this kind of **visceral anti-conformism**, of recalcitrant impatience with all categorization and classification, which defined Michel Foucault, to contribute to protect him against the reduction of one or other of his classificatory properties: knowledge historian, science historian, social sciences historian, social *scientist*, philosopher, philosophy historian, history philosopher, science history philosopher – none of these abusively restrictive labels would know how to define it. Let´s recall his relation to Marxism or the French tradition of epistemology (Bachelard, Canguilhem), of history of philosophy or history of science (Guéroult, Vuillemin), anthropology or structural history (Levi-Strauss, Dumézil), or even with Nietzsche, Artaud, or Bataille, does not mean to reduce it to "sources" or "influences", but to guarantee the means of capturing the distances by which he built himself; it is not a matter of placing him in the classificatory prison with which one wishes to confine him, but to allow him to escape, as he never ceased to do, as he would do if he were still here; it is a matter of defending him against the classifiers, the bureaucrats of thought – is Foucault Marxist or anti-Marxist, is he truly a philosopher? – this who worked with the ultimate energy and until the last moment **exploring the (intellectual and social) limits of his thought, taking distance from himself and his thought** – and with the social image of his own thought (BOURDIEU, 2013, p. 170, bold marks added).

Foucault was a philosopher of the diagnosis of the present, interrogation, transgression, nonconformity, counter-power, struggle for a non-fascist life, freedom, indignation, and demolition of evidence, by means of which he wrote "with rather feverish hands" (FOUCAULT, 1972a, p. 26). He destabilized evidence and questioned, often between commas, up to his time unquestionable constructions of truth.

He did so in themes that philosophy had not dealt with until then, by detailing history in the domains of (i) justice (dissecting imprisonment and confinement in their various manifestations – factories, barracks, hospitals, asylums, schools, etc.); (ii) medical and more properly psychiatric knowledge, especially regarding the pathologization of madness as a form of domination of the socially not framed; (iii) scientific transversality, when making history of the human sciences and philosophy, especially with a regard upon the concept of modern subject – subject and object of knowledge; and (iv) the analysis of sexual conduct as a body control *device*. More than working on these themes, Foucault renews and updates his respective areas of knowledge and their weaving.

For Foucault (2004a, p. 295), his "role", even if that was too much for the way he had imagined himself before knowledge, would be "to show people that they are much freer than they think; that they take for granted certain themes fabricated at a particular moment in history, and that this alleged evidence can be criticized and destroyed. "

Facing it as a way of life, Foucault therefore understood philosophy as a means of outlining emphases and making (even more) visible what is, strictly, visible. One reaches a parallel, therefore, with a Marxist tradition of unveiling, that is, that the real would be an object to be stoned and that the essence of things was reached from knowledge and the overcoming of a dominant ideology. It is not a question of seeking far (in the superstructure, for example), beyond the subject and of a certain *order* of things, the operating algorithm of what is conventionally called reality. This explanation, if actually existing, has always been for Foucault in the materiality of objects, in their occurrence, in a very precise field of operation, of appearance and disappearance.

A very concrete example of this view are the themes of madness, imprisonment and sexuality, worked on by Foucault from historical perspectives, in contrast to the way important philosophers had treated them. In these themes, Foucault rigorously executes what marks his work: the (re)construction of history, based on the assumption that madness, prison and sexuality, themes historicized by him, were not always as they are today (and, in their own turn, put themselves). These concepts were historically constructed, from the Greeks to modernity.

In the following passage, only illustratively, one sees how Foucault approached the historical construction of the concept of madness and its intersections with a particular way of life of the 17th century. It was here that madness, hitherto not pathologized, not considered a disease or even a threat to public order, began to be so, in a context of seeking to sanitize cities and to exclude socially distinct and economically unprofitable people.

> Hospitalization is an institutional creation proper to the seventeenth century. From the outset, it assumed a breadth that does not allow a comparison with prison as it was practiced in the Middle Ages. As an economic measure and social precaution, it has the value of invention. But in the history of folly, it designates a decisive event: the moment when madness is perceived in the social horizon of poverty, incapacity for work, inability to integrate into the group; the moment that begins to insert itself in the text of the city problems. The new meanings attributed to poverty, the importance given to the obligation to work, and all the ethical values attached to it, determine the experience of madness and change its meaning (FOUCAULT, 1972b, p. 78).

Foucauldian thinking seeks to denature all kinds of evidence. For Foucault, architecture itself is the object of the exercise of power. The construction of a city and its urbanistic definition segregates classes, dictates crossings, organizes meetings and imposes the focuses of culture, violence, locomotion; indicates center and periphery and by doing so, determines violence, marginality, exclusion. Geography defines life.

Another example could be the architecture of disciplinary spaces, especially schools. A platform facing chairs strategically placed in rows in front of it, a teacher's desk in the center and all possibility of exercising discipline and control. What does this have to do with how teaching and learning are organized? What Foucault does is to open the naiveté that lies in the thought that we and the power are separate in different poles. We are the effect of power, and Foucault wants to indicate a sight deviation for an analysis of the form and consequences of that power. It would be unimaginable, until then, for philosophy to deal with these themes, so far removed from its tradition.

This is where Foucault's analyticism breaks in, which in its turn cracks the inertia of thought and opens up other ways of seeing and being, looking at our own ways of being and our very concrete practices. How did we get here? Before us, the Greeks, for example, how did they think? Did they share the problems and means of solution at this time? Did they see sexual practices in the same way? And the prisons, what are they? And the discourse on madness — how and on what purpose was it constituted? And the practices of submission and confession — to which are they intended? All these questions relate to history and its contingencies and discontinuities. This is what Foucault has called our attention to.

> As for the motive that propelled me, it was very simple. For some, I hope, this motive may suffice for itself. It is curiosity — at any case, **the only kind of curiosity that is worth practicing with a little obstinacy: not the one that seeks to assimilate what should be known, but the one that allows**

**one to separate one from oneself.** Of what use would have the obstinacy of knowledge if it asserted only the acquisition of knowledge, and not in a certain way and as far as possible, the mischief of the knower? **There are moments in life where the question of whether one can think differently from what one thinks, and being able to perceive differently from what one sees, is indispensable to continue to look or reflect**. Maybe they tell me that these self played games have to stay behind the scenes; and that at most they take part in the preparatory works which disappear on their own from the moment they produce their effects. But what is philosophizing nowadays – I mean, philosophical activity, but the critical work of thinking on one's own thought? If it does not consist in trying to know in what way and how far would it be possible to think differently rather than legitimize what is already known? **There is always something derisory in philosophical discourse when it wants from the outside to make the law for others, to tell them where its truth lies, and how to find it**, or when it pretends to demonstrate itself by naive positivity; but it is its right to explore what can be changed in its own thought through the exercise of a knowledge which is foreign to it. The "essay" – which must be understood as a self-modifying experience in the play of truth, and not as a simplifying appropriation of another one for communication purposes – is the living body of philosophy, if at least it is still what it once was, that is, an "ascesis", an exercise of self, in thought (FOUCAULT, 1998, p. 13, bold marks added).

What is intended in this text, therefore, is to problematize theoretical perspectives of Michel Foucault´s thinking, especially in the domains of knowledge, power and ethics, articulating them with possible fields of research and practices in physics teaching. This is not an easy approach, much less obvious, although there is a possible contact zone. Foucault and Education (GALLO, 1997; VEIGA--NETO, 2014) is already a productively developed articulation.

It is up to us here, with the limitations and difficulties of such an approach, to rehearse and discuss its productivity. It is not intended, therefore, to present a summary or a method of Foucauldian analysis applied to physics. That would be too audacious for such a text. On the other hand, we think it is possible to present some concepts and theories of Foucault, like clues to seek to understand more and try to connect to the objects of physics teaching.

The thesis that is defended is that **theoretical contributions** of Foucauldian thought can be operated in the **analysis** of constitutive elements of **research in the teaching of physics** and, more broadly, of the **teaching of physics** itself, in the perspective of establishing paths, even **sidewalks**, in order to *think of them in other ways*.

## 2 FOUCAULDIAN DOMAINS

In the following table, we seek to explain what can be called "Foucauldian Domains" (VEIGA-NETO, 2014), organized by chronological, methodological (VEIGA-NETO, 2014) and ontological criteria (MOREY, 1991).

It is a didactic organization attempt of a thought that is certainly more pretentious, transversal and productive than this model which tries to delimit it.

**Frame 1 - Foucauldian domains by chronological, methodological and ontological criteria**

| Foucauldian domains | | | |
|---|---|---|---|
| **Elements** | **Archeology** | **Genealogy** | **Ethics** |
| **Theme** | to be-to know (subject of knowledge) | to be – to be able (subject of external action) | to be with oneself (subject of action on oneself) |
| **Object** | What can I know? | What can I do? | Who am I and who can I be? |
| **Central question** | How? | Why? | How do we become who we are? |
| **Method** | How knowledge is formed. | How a certain object arises (in relation to knowledge/power). | How is subjectivity constituted? |
| **Main Works (year of publication)** | History of Madness (1961) The Birth of the Clinic (1963) Words and Things (1966) The Archeology of Knowledge (1969) | History of Madness (1961) The Order of Discourse (1971) Discipline and Punish (1975) HS I - The Will to Knowledge (1976) | History of Madness (1961) HS II - The Use of Pleasure (1984) HS III – The Care of the Self (1984) HS IV - The Desires of the Flesh (2018) |

Source: Morey, 1991; Veiga-Neto, 2014. Frame elaborated by the author.

In the following sections, the exercise will be to present a brief synthesis of the Foucauldian proposal in each one of its ontological domains, seeking possible articulations with research and practices in physics teaching.

## 3 ARCHEOLOGY AND BEING-KNOWING: ELEMENTS FOR RESEARCH AND PRACTICES IN PHYSICS TEACHING

Foucault conceives knowledge as arising from systematized theories, with assumption in the scientific discourses legitimized in a given society[2], from a historical view: "the modern subject is not at the origin of the knowledge, he is not

---

[2] "[...] I suppose that in every society the production of discourse is at the same time controlled, selected, organized and redistributed by a number of procedures whose function is to conjure its powers and dangers, to dominate its random event, in order to dodge its fearsome heavy materiality" (FOUCAULT, 2012, p. 8).

a producer of knowledge but, on the contrary, he is a product of knowledge" (VEIGA-NETO, 2014, p. 44).

Discourse as a social practice appears in The Archeology of Knowledge:

> [...] I would like to show that discourse is not a slender surface of contact, or confrontation, between a reality and a language *(langue),* the intrication of a lexicon and an experience; I would like to show with precise examples that **in analysing discourses themselves, one sees the loosening of the embrace, apparently so tight, of words and things, and the emergence of a group of rules proper to discursive practice**. [...]no longer treating discourses as groups of signs (signifying elements referring to contents or representations) but as **practices that systematically form the objects of which they speak**. Of course, discourses are composed of signs; but what they do is more than use these signs to designate things. It is this *more* that renders them irreducible to the language *(langue)* and to speech. it is this 'more' that we must reveal and describe (FOUCAULT, 2014b, p. 59, bold marks added).

Discourse, therefore, is not a hidden element to be unveiled, but rather statements and relationships that take form and work through it. Discourse integrates and sets in motion "historical productions, political relations and concrete social practices, constructed and constructive of what has been agreed to call reality" (FERREIRA; LOGUERCIO, 2017, p. 7).

In attempting to approach scientific discourses, in addition to a rigorous and precise method, Foucault called it archeology – an excavation of layers, the discontinuous levels of pronounced speeches:

> [...] a comparative analysis that is not intended to reduce the diversity of discourses, or to delineate the unity that must sum them up, but rather to divide their iversity into different figures. Archaeological comparison does not have a unifying effect, but a multiplying one (FOUCAULT, 2014b, p. 195).

This proposal was operated by Foucault in the *History of Madness*, as he sought to denaturalize the medical discourse on madness and, in layers, place it as a historical construction and as a mechanism of subject production within this discourse. In *The Archeology of Knowledge*, in order to seek to understand how the modern subject thus constituted itself and was constituted *subject* and *subjected* of knowledge. Likewise, in *Words and Things*, in order to detail how this same modern subject, in the eighteenth and nineteenth centuries, was produced within the knowledge of the three great sciences: Linguistics, Biology and Economics.

The great object of archeology, in the sense of investigating being-knowledge, is to try to "isolate the levels of discursive practices and formulate the rules of production and transformation of these practices"[3] (VEIGA-NETO, 2014, p. 45). In other words, to dig a certain knowledge, a discourse in its materiality, seeking to understand how it appeared and transformed and, in and from it, increase its counter order, its overcoming.

Foucault (2014b, p. 157) addresses the principles of his archeology, which justifies the not so brief following quotation:

> 1. [...] seeks to define not the thoughts, the representations, the images, the themes, the obsessions that are hidden or are manifested in the discourses, but the discourses themselves, as practices that obey rules. It does not treat discourse as a document, as a sign of something else, as an element that should be transparent, [...]; it addresses the discourse in its own volume as a monument. It is not an interpretive discipline: it does not seek a more hidden "other discourse". [...]
>
> 2. Archeology does not seek to find the continuous and insensitive transition that binds, in a soft slope, the discourses to what precedes them, involves or follows. [...] Its problem is, on the contrary, to define the discourses in their specificity; show in what sense the play of the rules they use is irreducible to any other [...]
>
> 3. Archeology is not ordered by the sovereign figure of the work; it does not seek to understand the moment in which it stood out from the anonymous horizon. It does not want to rediscover the enigmatic point where the individual and the social are reversed into each other. [...] It defines types and rules of discursive practices that go through individual works, sometimes commanding them entirely and dominating them without anything escaping them; but sometimes, also, they are governed only by a part. The instance of the creative subject, while the reason of being of a work and principle of its unity, is foreign to it.
>
> 4. Finally, archeology does not seek to reconstruct what could be thought, desired, aimed, experienced, sought by men at the very moment they uttered the discourse; it does not propose to collect this fugitive nucleus where author and work change their identity; where thought still remains the closest to itself, in the still unchanged form of it, and where language has not yet developed in the spatial and successive dispersion of discourse. In other words, it does not try to repeat what has been said, finding it again in its own identity. [...] It is nothing more than a rewriting: that is, in the maintained form of exteriority, a regulated transformation of what has already been written. It is not the return to the very secret of the origin; is the systematic description of a discourse-object.

[3] [...] by the word practice, [Foucault] is not meant to mean the activity of a subject, [but] designates the objective and material existence of certain rules to which the subject is subjected from the moment he practices the 'discourse'. The effects of this subjection of the subject are analyzed under the heading: 'positions of the subject' "(LECOURT, 1980, p. 70 apud VEIGA-NETO, 2014, p. 45).

Archeology, in the sense of supporting the historical composition of this being-knowledge, questions the system of forming[4] a discourse, to say what this **comes to be**, in its layers, not to interpret it, do hermeneutics or find a certain hidden meaning. This search is not individual, nominal, authorial, referring to the subject or to the set of subjects who gave a certain discourse, but to the relations that give order to the discourse. It is not limited to discourse and tangents all discursive events.

From the perspective of research and practices in physics teaching, it is possible that the archaeological approach can contribute to the analysis of the contexts of formulation of an epistemic[5], of a field of knowledge and dispersion. It presents itself as a blunt form of interrogation and an attempt to describe how certain knowledge is formed.

The research and practice of teaching physics, as well as, more broadly, Pedagogy, use certain homogeneities that go back to the discursive formation of certain knowledge. The discourses that characterized and placed in their order a certain way of doing science, certain scientific priorities and certain institutionalized practices (for example, curriculum, technical rationality, experimentation by script, textbook as didactic centrality, architecture of the classes, the narrative as the protagonist of instruction, the elitism of the laboratory and the digital technologies applied to teaching, the predilection for demonstration and exercise, to the detriment of historical-philosophical perspectives, etc.) require legitimations that:

> they pass through the conviction of development agencies, institutional peers and equals in skills. Therefore, the discourses are constituted, maintained and reinforced (from inside to outside the university and also in the opposite direction), taking form in official documents and in proposals of formation of courses (FERREIRA; LOGUERCIO, 2017, p. 24).

Understanding archeology, first of all, as a perspective, a possibility of projecting lenses in the world, some problems could be object to it, in the research and practice of physics teaching: (i) *how have these themes (contents) that today are taught in physics so constituted themselves?* (ii) *Why did the production of this institutionalized science correspond to the teaching that it contains?* (iii) *At what time and from what assumptions have the physical education practices (experimentation, use of textbooks, use of educational technologies,*

---

[4] "a complex bundle of relations that function as a rule: it prescribes what must be correlated in a discursive practice, so that it refers to such or such an object, to employ such or such enunciation, to use such or such a concept, for to organize such and such a strategy" (FOUCAULT, 2014b, p. 88).

[5] "a set of relationships that link different models of discourses and correspond to a given epoch" (REVEL, 2011, p. 48). It is not a totalizing model of thought, but a dispersion of the articulation of multiple systems that bind to one another. In developing his thinking, Foucault abandons the notion of epistemic to adopt what he referred to as the more encompassing notion, that of *device*, which will be discussed later in this article.

*alternative methodologies, teaching by research, didactic approaches) been*
*formatted?* (iv) *At what point did the evaluation take such contours in physics?*
(v) And, more important than all: *how could this be different, in view of what it*
*is and how it was constituted?*

Research in this field and with this bias should aid in the search for understanding, particularly in the domains of research and practices in physics teaching, *how a given knowledge was constituted and become a regime of truth, in a given context, starting to determine the form, including the subjects of this knowledge and their practices*.

## 4 GENEALOGY AND BEING-BEING ABLE: ELEMENTS FOR RESEARCH AND PRACTICES IN PHYSICS TEACHING

Foucault does not seek to construct a truth of the sciences, to objectify them or even to give them a statute. The Foucauldian question is another: it goes on to **make a history of problematizations**[6], the history of how things produce problems in their materiality. That's what he termed *genealogy*.

Genealogy is regarded by Foucault as a method whose central object would be the search for understanding the emergence of certain configurations, certain forms of being, which could be attributed to subjects, objects and power relations, from discursive[7] and non-discursive practices. That is, genealogy is interested in the analytics of the discursive process (not the moment).

In the *History of Madness*, *The Order of Discourse*, *Discipline and Punish*, and the *History of Sexuality I: The Will to Knowledge*, one sees the concrete expression of the genealogical method. What takes a central stage in these works is power as the *possibility of explaining* how knowledge is produced and how we are constituted in the relation between knowledge and power.

Archeology would thus have a descriptive perspective (that is, how a field of knowledge is constituted, in view of the network of interconnections with other forms of knowledge); as for the genealogy, explanatory (seeking the origin – the *why* – of these forms of knowledge, how they would have been invested and constituted as such and what would be the conditions of possibilities external to these forms of knowledge, in a knowledge/power mesh).

---

[6] "Problematization does not mean representation of a preexisting object, nor the creation by discourse of an object that does not exist. It is the set of discursive or non-discursive practices that makes something enter into the play of true and false and constitutes it as an object for thought (whether in the form of moral reflection, scientific knowledge, political analysis, etc.)" (FOUCAULT, 2010, p. 242).

[7] "[…] a set of anonymous, historical rules, always determined in time and space, which defined, in a given epoch and for a given social, economic, geographical or linguistic area, the conditions for exercising the enunciative function" (FOUCAULT, 2014b, p. 144).

While "archeology intends to achieve a mode of description (liberated from all "anthropological subjection") of the regimes of knowledge in certain domains and according to a relatively brief historical cut", genealogy "tries, by using the notion of 'relations of power' what archeology should content itself to describe" (MOREY, 1991, p. 4, our translation)[8]. Genealogy, therefore, takes forms of knowledge as strategic elements, closely linked to the relations of power, from which its emergence and permanence derive.

In a very subtle way, it would be possible to say that archeology and genealogy converge into the search for interpretation – in archeology, by the bias of those who question knowledge; in genealogy, by those who master the systems of interpretation in a network of forces that surpasses the discourse and its practices.

> The genealogy of the modern subject unfolds in the examination of three distinct devices[9]: disciplinary, which takes the body as the focus of knowledge-power strategies, developing both a microphysics of power and a political anatomy of individuals; the security device that develops a biopolitics of populations, considering the human being as a species; and the device of sexuality, which emerges from questioning and intervention in relation to the subject, considering different modes of subjectivation […] First, genealogy is "dissociative", seeking to refute the existence of eternal , essences and identities, and trying to present the multiple, heterogeneous and disparate events present at the origin. Secondly, it is a "parody", destroying accepted values and realities, refusing to venerate them, which would allow the release of vital and creative powers. Finally, genealogy is "disruptive" of the subject of knowledge and truth, not only asking the truth of what is known and questioning who knows it, in order to propose a critique of the anthropological foundation of knowledge itself, that is, of the subject of knowledge (MORAES, 2018, on-line).

Foucault's central concern has always been the constitution of the subject. In this regard, he resorts to the analytics of power, taking it as the operator of subjectivation[10]. This justifies the concern to examine what he called *kidnapping*

[8] "la diferencia entre arqueología y genealogía es la que media entre un procedimiento descriptivo y un procedimiento explicativo: que la arqueología pretende alcanzar un cierto modo de descripción (liberado de toda "sujeción antropológica") de los regímenes de saber en dominios determinados y según un corte histórico relativamente breve; y que la genealogía intenta, por recurso a la noción de "relaciones de poder", explicar lo que la arqueología debía contentarse con describir" (MOREY, 1991, p. 4).

[9] Based on the work of Foucault and from the texts of Deleuze (1990) and Revel (2011), we understand *device* as a (linguistic or not) heterogeneous set of philosophical propositions, discourses, institutions, urbanistic apparatus, regulations, security measures etc., of concrete and strategic nature, which are juxtaposed and coordinated to produce effects of power and standardization, determining the distinction between scientific and non-scientific. They are, in short, operators of power who imbue themselves with knowledge. In physics teaching, we could exemplify devices such as law, curriculum, blackboard, "participation" grades, laboratory or experimental practices, college entrance exams, mathematical demonstration

[10] "The term 'subjectivation' designates, for Foucault, a process by which one obtains the constitution of a subject, or, more precisely, of subjectivity. The 'modes of subjectivation' or 'processes of subjectivation' of the human being correspond in reality to two types of analysis: on the one hand, the modes of objectification that transform human beings into subjects –  which means that there are only objectified subjects and

*institutions* (factories, barracks, hospitals, asylums, schools), not from the perspective of denouncing them, but from understanding their constitution, what effects they could produce and how one could subvert them.

From the perspective of discourses, genealogy seeks the explanation of effective formation

> [...] either within the limits of control, or outside them, or, more often than not, on both sides of the delimitation. Criticism analyzes the processes of rarefaction, but also of grouping and unification of discourses; genealogy studies its at the same time dispersed, discontinuous and regular formation (FOUCAULT, 2012, p. 61)

What is shown in Foucault is that there is no contraposition between discourse and power. "Discourses are elements or tactical blocks in the field of force correlations; there may be different and even contradictory discourses within the same strategy; they can, on the contrary, circulate without changing form between opposing strategies" (FOUCAULT, 1988, p. 112). It is in discourse and by discourse, therefore, that manifestations of power are seen, without existing, with this, compromising or stability.

Deleuze (2008) points out that Foucault, unfolding Nietzsche, considers power, one of the most relevant points of his work, as the most circumstantial analytical element to dissect the forms of knowledge, inside and outside. It was this element that characterized it as microphysical, as the force or the relations of force, besides constituting itself an element. Power is amorphous, insidious and very sophisticated; it requires attention to everything that circumscribes it.

Foucault makes a genealogy of the relations between knowledge/power that would relate to the individual, through disciplinary power, and to society, by state power.

> We have seen that the great goal of surveillance technologies is, through disciplinary means, to manufacture docile bodies. [...] this is achieved by a double movement: we are first objectified in a disciplinary network, composed of microscopic spatial and temporal divisions; almost at the same time, we see ourselves as subjects in this network — a network that seems invisible to us, which is why we think that discipline is natural. As I have explained elsewhere, genealogical analysis allows one to understand "the many practices that take place in the school environment as techniques that combine and give rise to true technology, the purpose of which is both to reach the bodies in their smallest materialities and to print them as permanent as possible certain social provisions" (VEIGA-NETO, 2014, p. 69).

that modes of subjectivation are, in this sense, practices of objectification; on the other hand, the way in which the relation with itself, by means of a certain number of techniques, allows itself to be constituted as subject of its own existence" (REVEL, 2011, p. 144).

Still according to Veiga-Neto, the school "was conceived and set up as the great – and (most recently) the broadest and most universal – machine capable of making bodies subject to disciplinary power; and thus make them docile" (VEIGA-NETO, 2000, p. 17).

To do genealogy, therefore, is to capture the power

> [...] at its extremities, where it becomes capillary; to grasp power in its more regional and local forms and institutions, especially at the point where, by going beyond the rules of law that organize and delimit it, it extends, penetrates institutions, is embodied in techniques, and relies on instruments of intervention material, possibly violent (FOUCAULT, 1979, p. 182).

We are constituted by political technologies, techniques of power[11]. Disciplinary power is perhaps the most apparent and most closely related to everyday school practices, such as examination and assessment.

> The other place where we see this new disciplinary technology appear is education. It was first in the elementary schools later in the secondary schools where we saw appearing those **disciplinary methods in which individuals are individualized within the multiplicity**. School brings together dozens, hundreds, and sometimes thousands of schoolchildren, and it is then a question of exercising upon them a power which will be much less burdensome than the power of the preceptor, which can exist only between the pupil and his teacher. There we have a teacher for dozens of disciples and it is necessary, despite the multiplicity of students, to achieve an **individualization of power, permanent control, vigilance at all times**, hence the appearance of this character that those who studied in schools know well: the surveyor, who in the pyramid corresponds to the army officer; quantitative notes, exams, competitions, etc., therefore, possibilities of **classifying individuals in such a way that each one is exactly in his place, under the eyes of the teacher or in the classification-qualification or in the judgment we make of each of them** (FOUCAULT, 1991, p. 30, emphasis added).

Examination and evaluation, by the way, are two of the greatest points of contention of the present teaching of physics. Seeking to sedentarize, hierarchize and normalize behavior and knowledge, these elements of disciplinary power

---

[11] Although in this text, we emphasize the disciplinary power, it is necessary to take into account that Foucault unfolded the devices of control also by the optics of: (i) *Biopower* (the techniques of discipline not of an individual, but of a group of them; it does not act on consciences, but on the body, for example, determining social behavior, which is the responsibility of hierarchical groups – children, women, prostitutes, homosexuals, the disabled, the elderly, etc.); (ii) *Biopolitics* (the power involved in controlling people, regulating and predicting risks in food, hygiene, health, sexuality and birth, where sciences such as demography, statistics and sanitary medicine take place); and (iii) *Governmentality* (understood as a set of institutions, procedures, strategies and management practices carried out by the Government on the population, with emphasis on economic knowledge and safety devices) (FOUCAULT, 2004b; 2004c). See more in Barrios (2014).

combine and act together. The rite of evaluation in physics is, therefore, preserved under the aspects of memorization, fear and failure. These instruments of power and control, with all their techniques and their consequent role in school, do not only act on what is already known (of known physics, of operational teaching), but at the level of all that you can still know. To whom does all this matter?

Concretely in the research and practices of physics teaching, the analysis of power, the genealogical examination, could be realized from two categories, if one can thus classify:

a) the first, at the microscopic level, seeking to analyze, in a school setting, *documents* that guide the teaching of physics (curricular parameters and guidelines, pedagogical projects, laws and regulations, etc.), *records* (research, laboratory scripts, textbooks, teaching guides, etc.), *rituals* (methodologies, emphases, descriptors, norms, constituted processes) and *evaluation practices* (evaluation weights, tests, works, selection exams for admission to higher education, etc.), not only the functioning, but the power relations that move in its constitution as a field of knowledge;

b) the second, at the macroscopic level, would be concerned with investigating processes by which these same school practices and the discourses on research and on physics teaching practices have developed and continued to develop under the disciplinary character of modern societies, including in its transition to the character of control, in view of the perspectives of *biopolitics* and *governmentality*.

Strictly speaking, genealogy would require an examination of the origin, form of manifestation, consequences and nontrivial relations of power associated with the constitution of the respective fields of knowledge.

In the domains of research and practice in physics teaching, for example, to investigate which correlations of forces have led to the prevalence of certain scientific societies, certain biases in academic publication, specific areas of knowledge and more prestigious research lines, some more recidivist methodologies and verified predilections, emphases and certainties. Who acted, with what strengths and from which assumptions, to assume a particular *order of discourse*?

# 5 ETHICS AND BEING-WITH-ONESELF: ELEMENTS FOR RESEARCH AND PRACTICES IN PHYSICS TEACHING

The concept of ethics, for Foucault, departs from the classical view of observance of moral precepts and approaches the idea of an honest *relation of self to oneself*. Ethics would thus define the conditions in which and the means by which the human being problematizes his constitution (what he is) and the world around him.

To talk about ethics, from the perspective of being-with-oneself, Foucault goes to Greece and Rome to seek the differences between the Classical and Modern Ages. What he consistently distinguishes for them is that the Greeks and the Romans did not have the same systematic preoccupation as modern man had with assuaging himself, that is, of copiously submitting to a set of external determinations on his life, especially those originating from Christian prescriptions. Foucault consistently developed this insight in the *History of Madness* and the three volumes of the *History of Sexuality – The Use of Pleasure, The Care of the Self and the Desires of Flesh*.

The formation of young Greeks was given by the arts of living, by the aestheticization of one´s existence, by the care of oneself (not in the narcissistic perspective – the narcissist is not, strictly speaking, a subject who knows himself, but who does not know himself and from that, idolizes an image that he builds of himself).

The Greek was, in essence, a subject who practiced freedom. Not to be an entrepreneur of himself, as capitalism and the notions of governmentality have clarified[12]. Rather, a handsome, balanced, temperate fellow who did not allow himself to be dominated by his instincts. And this not by self-renunciation or by renunciation of his instincts, but by emotional administration, thereby not allowing himself to be enslaved by his passions (such as the alcoholic, the polygamist, the kleptomaniac, the compulsive buyer, the nymphomaniac, etc.).

It was by studying the Greeks that Foucault identified that they maintained love between men not from the same frame (of disease, transgression or sin) that modern medicine classified. The Greeks understood love as an act between equals – and therefore possible between men but not between men and women or men and slaves, for example. Love, for them, would constitute an act

---

[12] This is what government makes of conduct by defining social normality, the characteristics of the different (homosexual, mad, prostitutes, etc.). The current Brazilian penal code, for example, does not clearly classify crimes against prostitutes, at the same time that differentiates infractions committed against "honest women". This vision, sometimes hygienist, or moralistic, makes the prostitute profession, for example, not regulated in Brazil (although it is not considered a crime either), besides being constantly portrayed as a case of public order, object of the use of police force as a form of state control and power device. It was to this sort of historical assuaging that Foucault paid special attention to. More details about the relationship between prostitution and the Brazilian legislation can be seen in Rodrigues (2004).

of equal and free men, a practice of freedom. And it is not for another reason that the Greek dictionary does not recognize the term "homosexuality", which has been used in the medical discourse (dating to the nineteenth century and with effects of power) that sustains the morality of a certain time, pathologizes and determines the subjects (the words that define the objects of which they speak...). This denaturalization, which was Foucault's obsession, clearly brought about the ruptures between Greek thought and modern thought, helping us to understand ourselves from the reconnection with the past and with the traditions.

If, on the one hand, the exercise of power developed its techniques of domination, on the other, the Greeks had techniques of self, of self-care: diet, sport, meditation, self-writing, sex, etc. The idea was that whoever cares for oneself is able to take care of the *polis*. Already in the Modern Era, being a citizen implies fulfilling precepts of the State, the Church, the family, the school and other institutions that play in the field of power. All the so-called *ethical crimes* (abortion, betrayal, etc.) were, in Foucault's view, meticulously placed in the service of domination. Criticism, then, is the link to disobedience.

This disobedience can be organized by the following question: *how to produce new forms of subjectivity?* For Foucault, the counter-order would pass, in the first plane, by the refusal of the subjectivity that has been imposed to us. For this, it is fundamental to question where is the origin of the concepts that imprison us and constitute us. The answer to these questions would then be the idea of connecting with oneself (being-with-oneself), reinvigorating links with tradition and seeking in our history and in our constituted knowledge, our enigmas and their keys. For Foucault, we can be another; there is no essence that *a priori* defines us, nor destiny that conditions us.

In the research and practice of physics teaching, Foucault's perspective of being-with-oneself could be implicated in the search for strategies of description and questioning of the subject produced in his practices. It would be useful, therefore, to analyze pedagogical *devices* (for example, judgment, control techniques, didactic actions and discourses) that organize and juxtapose in the production of the subject that researches, teaches and learns physics. What is more striking is that there is no neutrality in the techniques operated in favor of the search for control, motivation, regulation and evaluation in physics teaching.

Veiga-Neto (2014, p. 86) states that "official documents are concerned with proposing powerful exercises of self-determination and self-judgment, the result of which will be the fabrication of certain subjectivities molded to the demands of neoliberal society." In other words, the curriculum and all that derives

from it are at the service of producing a certain type of subject and that is what needs to be acknowledged and, in its incongruities, tackled.

What kind of subject is produced (or wished to produce) by the rationalist technical perspective with which physics teaching was constituted, particularly in Brazil? What subject is this that derives from a didactics based on the narrative and the teaching of classical physics only)? How is it constituted, in terms of its learning of physics, a subject submitted to contents and teaching techniques that do not recover the epistemological and philosophical aspects of science? What subject and what community are constituted from a teaching that gives a leading role to the textbook, scripted experimentation, eager for demonstration? What subject shapes oneself into a persecutory, punitive, classifying, and segregating evaluation? Which subjects do we help to know themselves from standardizing, excluding techniques, based on outdated and unsuitable theoretical frameworks? What subject results from a research in physics teaching that does not promote necessary revolution and a teaching that is not aimed at the basic purpose of learning and transforming? And lastly: what *profile* of researcher, teacher and student of physics do we have, necessarily, based on the very concrete practices of subjectivation, non-fomentation to being-with-oneself and on the reproduction of a certain *order of discourse*?

It is necessary, with great attention and a sophisticated look, to recognize the productivity, in terms of subjectivation, of activities that are considered trivial in the everyday of the classroom. Let us dare question what seems to be determined.
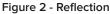
## 6 FINAL CONSIDERATIONS

We gave the subtitle of "sidewalks" (in Portuguese: "*veredas*") to this text as a simple attempt to put it in some perspective with the novel *Grande Sertão: Veredas* (ROSA, 1994). In that brilliant text, Guimarães Rosa dedicated himself to problematize and emphasize the Brazilian backlands in the 1950s, mythologizing and demystifying it at the same time.

In the book, Rosa points out that "[...] the real is not on the way out or on arrival: it is arranged for us to be in the middle of the crossing" (ROSA, 1994, p. 86). It is in this same perspective that we attempt, in this text, to expose Foucault's thought: that this supposed *reality* is found neither in words nor in the things they name; that they are neither outside, nor within the discourse, but, at their length; that they are neither power nor derivation from it, but, its plot. The *real*, as we conceive it, is in the *middle of the crossing*, in the emphases and in the silences, in all places where our eyes can reach in the perspective of doubting them and resizing them.

This is, therefore, the sidewalk, the path, the shortcut, the narrow path we intend to find in Foucauldian thought to illuminate all that we have already understood to be the research and practice of physics teaching.

The way we become used to doing research in physics teaching and teaching physics, the *devices* we use, the knowledge we make for and as a consequence of that, are not neutral. They are located in a field of determination of knowledge, a space of exercise of power and in a zone of constitution of subjects. It is the attempt to organize these correlations that we seek to find in Foucault in the perspectives of being-knowing, being-being able and being-with-oneself.

I beg leave, in the end, to try to summarize by an image what Foucault's work ends up giving us.

**Figure 2 - Reflection**



Source: Gnosis Brasil, 2018.

Foucault does this: he puts before us a large mirror and seems to give us the message to look at ourselves, look at our truths, our influences and our practices. It is from this that in any field, and particularly in research and practice in physics teaching, we can seek other ways of seeing.

## BIBLIOGRAPHIC REFERENCES

BARRIOS, E. V. Biopoder, Biopolítica y Gubernamentalidad: referentes de interpretación y crítica del poder managerial. **Organizações e Sustentabilidade**, Londrina, v. 2, n. 2, p. 3-37, jul./dez. 2014.

BOURDIEU, P. Um pensador livre: "Não me pergunte quem sou eu". **Tempo Social**, São Paulo, v. 25, n. 1, p. 169-175, 2013.

DELEUZE, G. **Michel Foucault, filósofo**. Barcelona: Gedisa, 1990.

_____. **Conversações**. São Paulo: Editora 34, 2008.

FERREIRA, M.; LOGUERCIO, R. Q. Enunciados em Propostas de Ensino-Pesquisa-Extensão em Cursos de Física a Distância: para além dos Conteúdos, os Discursos. **Revista Ensaio**, Belo Horizonte, v. 19, n. 1, p. 1-33, 2017.

FOUCAULT, M. **A Arqueologia do Saber**. Rio de Janeiro: Editora Vozes, 1972a.

_____. **História da loucura na Idade Clássica**. São Paulo: Perspectiva, 1972b.

_____. **Microfísica do Poder**. Rio de Janeiro: Edições Graal, 1979

._____. **História da Sexualidade I**: a vontade de saber. Rio de Janeiro: Graal, 1988.

_____. **Vigiar e punir:** história da violência nas prisões. Petrópolis: Vozes, 1991.

_____. **História da Sexualidade II**. O uso dos prazeres. Trad. Maria Thereza da Costa Albuquerque. 8 ed. Rio de Janeiro: Edições Graal, 1998.

_____. **Ditos e escritos**: ética, sexualidade, política. Rio de Janeiro: Forense Universitária, 2004a.

_____. **Nacimiento de la biopolítica**. Buenos Aires: Fondo de Cultura Económica, 2004b.

_____. **Seguridad, territorio y población**. Buenos Aires: Fondo de Cultura, Económica, 2004c.

_____. Verdade, poder e si mesmo. In: MOTTA, M. B. Foucault: ética, sexualidade, política. Rio de Janeiro: Forense, 2006a. p. 294-300.

_____. A ética do cuidado de si como prática da liberdade. In: MOTTA, M. B. **Foucault**: ética, sexualidade, política. Rio de Janeiro: Forense, 2006b. p. 264-287.

_____. **El sujeto y el poder**. 2007. Available on: http://www.campogrupal.com/ poder.html. Accessed on: 15 sep. 2018.

_____. **Ditos & Escritos V**: Ética, sexualidade, política. Rio de Janeiro: Forense Universitária, 2010.

_____. **A ordem do discurso**. São Paulo: Loyola, 2012.

_____. **Isto não é um cachimbo**. 1. ed. Travessa: São Paulo, 2014a.

_____. **A Arqueologia do Saber**. Rio de Janeiro: Forense Universitária, 2014b.

GALLO, S. **Repensar a educação**: Foucault. Filosofia, Sociedade e Educação. Marilia: UNESP, 1997.

GNOSIS BRASIL. **Reflexo**. 2018. Available from: http://gnosisbrasil.com/artigos/julgamos-demais/attachment/reflexo/. Accessed on: 25 Sept. 2018

JAPIASSÚ, H., MARCONDES, D. **Dicionário Básico de Filosofia**. 4. ed. Rio de Janeiro: Jorge Zahar, 2006.

MAGRITTE, R. **La trahison des images** (A traição das imagens). [Oil on canvas.]. Los Angeles: Los Angeles County Art Museum, 1929.

MORAES, M. V. M.  Genealogia - Michel Foucault. In: MARQUES, A. C. D. R. et al (org.). **Enciclopédia de Antropologia**. São Paulo: Universidade de São Paulo; Departamento de Antropologia, 2018.

MOREY, M. La Cuestión del Método. In: FOUCAULT, M. **Tecnologías del Yo y Otros Textos Afines**. Barcelona: Paidós Ibérica, 1991. p. 9-44.

REVEL, J. **Dicionário Foucault**. Rio de Janeiro: Forense Universitária, 2011.

RODRIGUES, M. T. O sistema de justiça criminal e a prostituição no Brasil contemporâneo: administração de conflitos, discriminação e exclusão**. Soc. Estado**, Brasília, v. 19, n. 1, p. 151-172, 2004.

ROSA, J. G. **Grande Sertão**: Veredas. Rio de Janeiro: Nova Aguilar, 1994.

VEIGA-NETO, A.  Espaços, tempos e disciplinas: as crianças ainda devem ir à escola? In: ALVES-MAZZOTTI, A. et al. (org.). **Linguagens, espaços e tempos no ensinar e aprender**. Rio de janeiro: DP/A, 2000. p. 9-20.

_____. **Foucault & a Educação**. 3 ed. Belo Horizonte: Autêntica, 2014.