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The challenge of bad infinity: A restatement of Hegel's critique of mathematics

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Abstract

Hegel's critique of mathematics cannot be reduced to mathematics alone. At least this is the stake of the present paper: to argue that a comprehensive understanding of the matter cannot be confined strictly to the philosophy of science. Indeed, Hegel's philosophy of mathematics pervades his entire ontology and, within the system, his political philosophy. Starting with Hegel's logic, the article advances towards the fact that Hegel did not reject mathematics in itself, nor he denied the incalculable merits of exact sciences made possible by applied mathematics. What he considered risky regarding mathematics was its revindication of the explanation of movement to the disadvantage of philosophy. Hence, the possibility of a technocratic world incapable of seeing and going beyond itself.

Keywords: quantity, quality, becoming, mechanism, true infinity

Introduction

One of the most underrated and less understood Hegelian philosophical stances is that relating to mathematics. Bertrand Russell, for example, in convinced that 'errors incorporated (…) in what Hegel has to say about mathematics, die hard' (Russell 1920, 107; see also Russell 2010, 290). For Russell, Hegel was nothing more than an obscure and pretentious philosopher that has gravely misjudged the intellectual and civilizational possibilities of modern mathematics without truly comprehending it; instead, Hegel would have done nothing more than to dogmatically force mathematics into his totalizing ontological system without ever ascribing a proper place for it. While the latter may contain a grain of truth, to a certain

extent (Fleischhacker in Petry 1993, 223-224), the former is definitely erroneous.

Hegel's highly abstract and dense prose made his ideas in various epistemological fields difficult to understand, and continue to do so today. However, as Terry Pinkard points out, he was not at all a dilettante with reference to the mathematics of his age (Pinkard 1981, 459-461). Furthermore, 'Hegel had a working knowledge of contemporary mathematical material; he practiced differential and integral calculus and for a time actually taught it. Moreover, he was clearly aware of the questions that had arisen in mathematical practice itself and of their underlying theoretical implications' (Lacroix 2000, 298). Not only that; Hegel also mastered ancient Greek mathematics and geometry and advanced important parallels between modern and Greek mathematics (Moretto in Petry 1993, 164-165). After his death, when his public library was publicly auctioned in 1832, many important works of mathematics, physics, chemistry and optics were found. However, Hegel's own works lead to the conclusion that he had consulted many more books on these topics in order to be able to conceive his philosophy of nature and his philosophy of mathematics (Mense in Petry 1993, 669-710; Bronger in Petry 1993, 711-720).

This paper presents Hegel's critique of mathematics in close connection to his logic. It starts by analyzing Hegel's notions of quantity, quantum and mechanism as exterior abstractions of being that entail the risk of permanent non-dialectical repetition and thus of bad infinity, which in turn is the undesirable premise of bad reality. The second section of the article stresses the importance of notions like quality, consciousness and purpose, and how they relate to the concept of true infinity. Although quality appears, In Hegel's philosophy, prior to quantity, which is just an undetermined abstraction of it, their separation is just a moment on the speculative path of reconciliation: quantity arising from the initial quality of being is, in its isolated exteriority and self-sufficiency, nothing more than blind necessity. Without a proper rational liberty to guide it and make it socially meaningful, quantity cannot ground and construe itself exclusively from itself, thus being bound to err. As a prominent

quantitative science, mathematics cannot extract its basic principles only from itself: it needs an otherness in order to understand itself as part of the greater allness (Lacroix 2000, 312; Fleischhacker in Petry 1993, 212-215).

Next, the third section is centered strictly on Hegel's approach to mathematics, which he rejects not integrally, but only when it tries to replace philosophy and offer its own, separate understanding of movement. But mathematics, as any quantitative science, cannot perceive movement in its dialectical complexity. Therefore, there is an almost unavoidable risk that mathematics, left uncheck by an adequate qualitative purpose, will resort to treat movement as a pure repetition of identical ones (Posch 2004, 7-9). Consequently, bad infinity will take over true infinity and the world as a phenomenological progression of spirit will be compromised.

Finally, the conclusions section summarizes the whole discussion: mathematics without philosophy is quantity without quality, intellect without reason, necessity without liberty. However, beyond the arguments advanced by the above quoted authors, which are confined, in general, to the philosophy of science, my article implies that Hegel's critique of mathematics is more than scientific: in certain respects, it is intrinsically political.

Quantity, quantum and mechanism: the challenge of bad infinity

Hegel's *Science of Logic* starts from a basic assumption: it is impossible to ground philosophy as being's understanding of itself from a certain principle. Whatever that might be, it is false. Philosophy is first of all movement, dynamics, not a static reality. Therefore, all these principles (substance, water, one, idea, monad etc.) are nothing more than moments of a larger and superior process, the process of becoming (Hegel 2010; Hegel 2015). But this process becomes aware of itself by understanding its limitations and mediations inside the web of existence. It follows that the simple thought represents the first form of consciousness; in this way, quantity as pure

unconscious agglomeration of numbers, of single identities non-differentiated in themselves – gives birth, from itself, to quality (Hegel 1986a, 6-9). In itself, as series that made the repetition of numbered manifolds possible, quantity already contained quality as potentiality (Lacroix 2000, 305).

But quantity is not so easily overcome. Even if for Hegel matter is only an abstraction (Hegel 1978) that thinking treats dialectically (Hegel 2006) and therefore molds it in various ways and, through universalization, places material reality to the coordinates of spirit (Hegel 2014) – quantity's utmost importance should not be overlooked. After all, quality is nothing more than the dialectization of different quantities; quality is therefore immanent to quantity and represents the possibility of the latter to acknowledge and make adequate use of the differences that arise from itself (Lacroix 2000, 304; see also Hegel 1971, 2014).

As the realm of the numerical, quantity is therefore primary perceivable trough simple identities indifferent to one another: numbers. Up to this point, this is a truism; however, Hegel's philosophy of numbers as incomplete thoughts and 'enigmas' is not tantamount to his understanding of quantity. True thinking is direct connection with the universal. But number thinking does not signal the universal; a thought number relates only to itself and its material determination and is strikingly indifferent towards difference. Hegel gives us the example of three, which is a simple addition of three by one, each of the ones being irresponsive towards the other ones. In other words, one is just 'discontinuity', the 'pure negative' (Hegel 1970; see also Hegel 2010, 148; Hegel 2015; Hegel 1984, 165-166).

Numbers produce quantity. Even if the seeds of quality are planted inside it as series of identicals waiting to be made aware of their limitations, this prospective quality is just a possibility, although at a certain point possibility becomes necessity (Hegel 2010). Due to the fact that numbers are indifferent towards one another and towards existence in general, their lack of continuity and procesuality signals the lack of determination in quantity. Better said, quantity is indeterminate in the absence of quality which can make it

aware of this prerequisite of movement. And, for Hegel, the essential problem of philosophy is the always imperfect reconciliation between being and thought (Hegel 1995a); because thinking is dialectics conceived as exteriority about to return to itself from itself, existence in itself is movement. It follows that insufficiently thought existence is quantity, motionless manifolds unaware and totally indifferent with reference to their reciprocal determinations. Quantity thus in itself contradicts the inherent dynamics of existence.

As for quantum, Hegel defines it as something superior to quantity. The reason is that quantum accommodates the series that place numbers in certain continuities, even if numbers still remain unaware of these relations between them. Quantum is thus quantity that repeats itself without the real possibility of transgressing itself: the quality it comprises is therefore insufficient to propel it to sublate into its otherness, true infinity. Quantum is nothing more than bad infinity, an incompatibility which is not to be confounded with dialectical contradictions.

> Number is quantum only as negative *one*, as a determinate aggregate of the *ones* it comprehends within itself; but in these, number does not have a limit either, for as *ones* they are likewise unity, a connection of numerical *ones*. Hence, in that it connects a determinate aggregate – whereby alone it is quantum – number posits itself in fact only as an indeterminate aggregate; for the connected *ones* are indeed a unity that is equal to itself, or not limited; in this way as well [they are] as something limited, equal to what it is not limited. Quantum posits itself as equal to what it excludes from itself, and so in truth it does not exclude it. Insofar as quantum is considered as self-subsisting being from which an other is excluded, to this extent it has (…) positive unity or non-limitation, non-excludedness. Going on beyond the limit *ad infinitum* and dividing inwardly *in infinitum* is one and the same for each, so that the limit and determinacy posited in it is no limit, no determinacy; in quantum the absolute contradiction or infinity is posited (Hegel 1986a, 17; emphasis in original; see also Hegel 2015).

The sensible, phenomenological world is for Hegel the finite world, the world of intellects, of individuals that cannot think beyond their daily pragmatism and perceive contradictions as being absolute, not transitory (Hegel 1988;

Hegel 1977a) – and the world of quantities. Infinity is not the 'beyond' of this world, is not something metaphysical, in other words; infinity is nothing more than the capacity of the finite to differentiate within itself and to move itself in an open, progressive direction (Hegel 2010). Infinity is therefore a concept (Lacroix 2000, 303; Pinkard 1981, 461-464) and the qualitative that allows quantum to go beyond itself while preserving itself as speculative unity between quantity and quality. This is the true infinity. Bad infinity, on the other hand, is just the mechanical repetition of identical ones inside quantum as isolated and self-sufficient entity: the appearance of dialectics, the appearance of progress, the appearance of movement. Hence, bad infinity paves the way for bad reality.

Next, mechanism is a kind of dynamized, phenomenological quantum that possesses no intelligibility in itself, but becomes aware of itself only insofar that is infused with purpose (Hegel 2010). The impossibility of finding its reason in itself can drive mechanism into a relentless repetition of empty identicals that can eventually turn the world into a mechanical abstraction that impedes qualitative change and ultimately political progress.

Quality, consciousness and purpose: the dialectical comeback of true infinity

As previously discussed, quality is a dimension of quantity, not something that lies outside it. However, quality is superior to quantity through its capacity to understand limitations. The potential quality nurtured in its incipiency as differentiation arising from series of numbers that accrue the quantitative is therefore consciousness that became aware of the phenomenological mechanism as negativity awaiting to be superseded into its constitutive other: liberty, spirit, true infinity (Hegel 1986a, 9-12). In itself, mechanism pertains to nature alone (Hegel 1979, 119). But Hegel's philosophy of nature understands this realm of absolute necessity as the otherness of the Idea that is about to be negated in order to be made part of the self-creating spirit (Hegel 2014).

Unlike quantity, which is immune to the mediation, the determinacy of things brought together by the conjunctural shapes of existence – quality is practically born out of mediation (Hegel 2010). This allows it to grasp the absolute as totality of mediations in movement and to understand the wholeness articulated by purpose as the supreme ontological truth (Hegel 1977b).

> In the limit the nothingness of reality and negation is posited, along as their being apart from this nothingness; *in this way quality itself is realized in the limit*; for the limit so expresses the concept of quality as the being *per se* of the determinacies, each on its own account, are posited as indifferent to each other, as subsisting apart from each other. At the same time each, in accordance with its content, express not determinacy in general (as it does in the concept), but rather determinacy as determine, as reality and negation; in other words, with respect to each [each expresses] what would be only in the antithesis or in connection with the other; this connection with the other (being taken back into itself and because as relation it is only external to it [is] now itself posited with respect to it; the one, itself the nothingness of the qualities, the other, their being (Hegel 1986a, 6-7; emphasis in original).

Limit produces consciousness, and consciousness produces purpose. Without purpose, the whole phenomenological mechanism would be inconceivable. Purpose is the concept of mechanism, just as reason is the concept of reality. A combination between existence and essence, the latter amounting to simple reflection of being in itself as idealization, reality is, as we recall, in perpetual movement. As the concept of reality, a potentiality immanent to reality itself that compels it, both in the present and at a historical scale, to better itself according to the forms the spirit possesses and will embrace for different context and generations – reason is the promise of a humanity that would eventually overcome alienation by gradually converting, through meaningful and dignified work, the hostile exteriority of the world, appropriating it as a known and incorporated interiority (Hegel 2010). Nobody knows how this ontological process will unfold; moreover, it is irrelevant and even dangerous to assert predictions in that direction. Hegel himself disregarded these excessive attempts of prospectivity, of trying to map the future

at any cost (d'Hondt 1993) by arguing that every philosophy belongs entirely to its own epoch, serving, conscious or not, the interests of that epoch (Hegel 1995b).

As pair of opposites that exist only through each other, quality and quantity are eventually reconciled in the concept of measure, which is both limit and number. And, being the first moment of being, quality excludes quantity as something different from itself. Measure helps overcome this contradiction by bringing back the previously excluded quantity into the understood and assumed wholeness of being. Mature quality has grown aware of immanent appurtenance to quantity, while negated quantity is posited, on its turn, to a superior level (Hegel 2010; see also Fleischhacker in Petry 1993, 219-220). Measure has thus become the promise of true, dialectical infinity, in a process in which quantity is gradually conveyed into necessity and quality into liberty.

Beyond the surface of things: mathematics as pure abstraction with only phenomenological implications?

Taking into account Hegel's logic and his philosophical approach on quantity and quality, his critique of mathematics becomes less ambiguous. The main point of the philosopher's stance against mathematics can be summed up in this way: mathematical truths are aware only of themselves, while philosophical truths are aware both of themselves and mathematical truths. And of many other truths, coming down to the final truth, the whole. So, mathematical truths are isolated truths and this turns them, into the long term, into errors. Mathematical truths do not grasp the essence, but only the existence of things. And pure existence is, like we have seen, only the negative (Hegel 1977b).

Furthermore, it follows that philosophical knowledge is the consciousness of becoming as totality, as the sum of being, things and their according concepts. But mathematical knowledge, due to its specific object of study, quantity, does not understand movement in this dynamic complexity. It only understands the movement of the thing in itself, which

amounts to bad infinity and its counterpart, bad reality (Hegel 1977b).

Still, Hegel insists that mathematics, within certain limits, is a perfectly valid and useful form of knowledge. However, due to the fact that its intrinsic purpose is extension, mathematics remains anchored in the realm of the quantitative, the bad infinity, because extension is not a real concept, only an iterative process of empty identicals, of numbers. In respect to truths like space and unity, mathematics is, according to Hegel, a valuable science. But reality as movement consists not only of space, but of time as well, and of history as the phenomenological keeper of time. The dialectical process of becoming is nothing more than space being sublated into time (Hegel 2014; Hegel 1986b). Unlike Kant's concepts of space and time, which are reducible to subjective intuition and therefore to intellect (Kant 2008), Hegel understands space and time in a speculative manner which overcomes and also maintains personal experiences while conveying them to the universal.

Notwithstanding, mathematics continues to reduce time to space and unity and to annul real, dialectical movement by confining it to the sterile movement of unities numbered or about to be numbered. Consequently, a form of bad equality arises, one that does not take into account the hierarchical differences existing in reality (phenomenology and spirit, intellect and reason, quantity and quality, necessity and liberty) (Hegel 1977b; see also Posch 2004, 10).

Next, "Applied mathematics orients pure mathematics towards the quantitative relations of nature, which it extracts from experience" (Hegel 1986b, 145). Thus, pure mathematics supersedes itself into empirical sciences like physics and/or mechanics. But, for Hegel, "nothing (…) can be demonstrated from experience" (1984, 257). Just like mathematics, experience cannot ground itself in itself, but only outside itself (Fleischhacker in Petry, 213). It follows that empiricism in general, all positive sciences are, because of their incompleteness, incapable of offering an adequate understanding of reality:

> the completion of a science demands not only that intuition and image be combined with the logical [dimension] and taken up into the purely ideal [realm]; the separate (though genuine) science must also be divested of its singularity (…), and its principle must be recognized in its higher context and necessity and thereby itself be completely freed. Only by this means is it possible to recognize the limits of the science, and without this principle, the science must remain ignorant of its limits, because it would otherwise have to stand above itself and recognize in the absolute form the nature of its principle in its determinacy; for from this knowledge (…), it would directly obtain the knowledge and certainty of the extent to which its various determinacies were equal (Hegel 2004, 103).

Moreover, Hegel does not treat empiricism only as a scientific problem, but also as a historical and ultimately as a political problem. For him, exacerbated empiricism signaled a sort of "blind attachment to historical tradition inconsistent with rational judgment". This may seem counterintuitive since, today, empiricism is associated to critical and scientific openness; for Hegel, however, it meant the exact opposite (Hegel 1984, 138). Starting from this, it is important to keep in mind that, two and three centuries ago, mathematics, physics and philosophy possessed relatively different meanings than they do today, both for Hegel and for Isaac Newton, the father of modern physics. Hegel eagerly pointed out what he considered to be the major flaws and shortcomings of his science, in a language that has puzzled and exact scientists ever since (Fleischhacker in Petry, 218-219).

Finally, empiricism's problems are also philosophical, not only scientific and political. As Fleischhacker rightfully observes,

> In Hegel's view the basic mistake of modem epistemology is that the so-called finite form of knowledge, in which the object is understood as being ultimately determined in itself and therefore distinct from the object as it is known, is taken as the paradigm of knowledge as such. He points out that this has led to Kant's notion of the thing-in-itself, in which the distinction between the object as determined in itself and the object as known, has become an abstract negation. The notion of the thing-in-itself is self-contradictory, for at one and the same time it is both an abstraction without content and the most concrete kind of reality (Fleischhacker in Petry 1993, 215).

Not only that it leads to the Kantian epistemological trap of the thing in itself, thus undermining the capacity of reason to truly infuse and orient reality in an emancipatory way – but empiricism is also bound to incorporate formal and a priori Kantian notions like numbers or space in order to demonstrate what it has set out to demonstrate. But, as Hegel warned us before, a science cannot proceed exclusively from abstract notions in order to validate a certain kind of experience; by doing so, the whole scientific structure is placed on a fragile and self-eroding scaffolding (Hegel 1970; Hegel 2003, 60-62).

Coming back to Newton, Hegel's basic reproach regarding his physics is that he converts mathematical abstractions into "physical actualities" (Lacroix 2000, 323). It is important to understand that Hegel is not against applied mathematics and physics *per se* (Hegel 1986a, 14), but only to the extent they aim, consciously or rather not, to confiscate the concept of movement from philosophy and to present it in pure mechanical, repetitive terms.

> Hegel, far from opposing the application of mathematics – more specifically: of analysis – to mechanics, did have a certain idea of this application. This idea can be characterized as follows: experimental physics should examine the motions (and other changes of state) of bodies under certain idealized conditions. Incidentally, Hegel does not stress the aspect of idealization very much, he rather stresses the necessity of making experiments without doing too much violence to nature (...). Now the motions thus examined by experimental physics should *not be explained* by any comprehensive theory; least of all should *forces* be introduced into the scientific description as explanatory principles, such that different phenomena would be derived from one basic set of concepts (e.g. space – time – mass – force or e.g. space – time – mass – energy). The latter task should be reserved to philosophy, since there is – according to Hegel – nothing between "the empirical" on the one hand and "philosophical theory" on the other hand. If it is not reserved to philosophy, and more specifically to a dialectical system of philosophy, some sort of a mechanistic worldview will inevitably result (Posch 2004, 9).

As previously noted, Hegel stressed out without any ambivalence the superiority of philosophy in respect to exact sciences, and in particular to mathematics, mainly for this

specific reason: the plenary understanding of movement belongs to philosophy alone and cannot be encroached on by exact sciences. Is it possible for Hegel's assumption to be more meaningful for the world we live in today than for the world he was contemporary with?

Before reaching the conclusion section, it is important to mention once again that Hegel does not reject mathematics and the exact sciences uncritically, but only to the extent they can and are willing to substitute themselves for philosophy. Undoubtedly, Hegel did not disdain the applications of mathematics and physics in the technical advancement of modernity and the colossal improvement of everyone's life in this ongoing process; on the contrary, he welcomed them as a new stage in the advancement of world spirit. Furthermore, Hegel would have probably been enthusiastic about submarines, airplanes, man's exploration of cosmic space, computers, internet and so on. All of these would have been impossible in the absence of applied mathematics, physics and mechanics, and all of them are now part of humanity's collective treasure. What he did not welcome and intuited, to a certain point, was, as Thomas Posch presented in the quote above, the danger of a self-sufficient technological world in which philosophy is reduced to a less and less relevant form of guilty consciousness. Could that be the world we live in today, the world of neoliberal technocracy and free market fundamentalism? Could it be, as stated in the introduction section, that Hegel's critique of mathematics is ultimately political?

Conclusion: mechanical necessity subsumed to teleological liberty, despite the contemporary mechanization of the world

For Hegel, every aspect of reality is fungible in historical and eventually political terms. This happens because spirit is not a mystic, extra-mundane notion, but communities and societies understanding themselves in ever more integrative ways, both in themselves as to one another. Dialectical becoming rests on the expansion of political consciousness: only well-organized

states can nurture the progression of spirit, and can do so only if they are authentically backed by their citizens.

It follows that teleological purpose, the rational dynamic of history that drives the phenomenological mechanism in its own pace, without having to hurry (Hegel 1995b) – depends on a philosophy that has political underpinnings. If in Hegel's times and today as well states can be considered, despite their enormous shortcomings, crimes and errors – "God's walk through history" (Hegel 2003, 275-281), no one can say precisely if this will still be the case in the future centuries. After all, Hegel often told his students that "the world spirit might take forms never contemplated in the system" (Hegel 1984, 53, 99, 337, 540).

We have seen how Hegel questioned mathematical truths, considering them unable to overcome their quantitative condition and depending on exterior references for their grounding. Starting from here, we can place Posch's finding of a "mechanistic worldview" (Posch 2004, 9) arising from philosophy being pushed gradually aside in favor of mathematics and physics with reference to the interpretation of movement – in a new perspective.

Hegel made it rather clear, as a gymnasium director in Heidelberg, that classical studies were underrepresented in relation with other disciplines, among which arithmetic, algebra, geometry and physiography (consisting in cosmography, natural history and physics) were held into high esteem (Hegel 1961, 330). Moreover, "It has been said that activity of mind can be trained on any material, but best of all by external, useful, and visible objects which are supposed to be most appropriate to the age of youth or childhood, since they pertain to the compass and manner of mental development peculiar to this age" (Hegel 1961, 325). Hegel was therefore subtlely implying that classical studies, Greek culture, history and mythology, followed by Latin language, were more appropriate disciplines to be taught to children than exact sciences. This is not to say that exact sciences should have been omitted altogether from the curricula; they simply needed to be placed on a secondary position with reference to classical studies because classical studies are one of the most important

elements the state has at its disposal for fostering future citizens with a proper political conscience. After all, "the highest form of ethical (political, m.n.) life" lies "in the life of a well-ordered state" (Hegel 2009, 23; see also Hegel 2003, 196).

Proper educated citizens are able to distinguish between quantities and qualities and to grasp the dangers of the "mechanization" of a world in which philosophy is no longer important. One could add that this process of mechanization started in the 18th century, decades before Hegel was born. Liberal "governmentalization", as Michel Foucault calls it, coupled with the rise of biopolitics (Foucault 2010; Foucault 2009; Foucault 2003) and modern statistics as a form of the modern power/knowledge discourse – signaled from the beginning a relentless need of modern states to streamline the administration of their populations and territories trough the newest quantitative techniques available (Scott 1998). Moving on to the 20th century, Herbert Marcuse denounced the automatization of Western consumerist societies and the powerful contradictions it creates, along with a sentiment of permanent frustration and anger (Marcuse 2007). Finally, Martin Heidegger criticized the self-destruction of the modern man that tries to produce itself through technics and therefore is irremediably bound to fail (Heidegger 2013).

Furthermore, liberal and neoliberal governmentality, in which the political dimension existent in classical liberalism is quantified by being subsumed to economics, a science understood by neoliberals as being mathematically precise, not in political terms that risk configuring possible alternatives to the existent hegemonic discourse – depends on the ideology of the free market, an ideology which neoliberalism transforms into pure fundamentalism. And when, consequently, politics becomes an annex of the free market, the mechanization of the world is finally complete. As James Scott pertinently observes, "A market necessarily reduces quality to quantity via the price mechanism and promotes standardization; in markets, money talks, not people. Today, global capitalism is perhaps the most powerful force for homogenization, whereas the state may in some instances be the defender of local difference and variety" (Scott 1998, 8). By imposing market quantification as the only

solution to the problems confronting modern societies, neoliberal capitalism has taken away politics from citizens and converted it into the presumably exact science of economics. However, as any quantity is nothing more than a former quality that has been reified (Hegel 2010), so too the market was, at the beginning, a superior form of emancipation in comparison to the so called divine monarchies and the whole feudal system.

But this "scientification" of politics as a means controlling and finally eliminating any real political debate is not new. Marxists have brilliantly exposed it from the middle of the 19th century. Many decades after, communist regimes ended up by creating their own forms of political "scientification" (like scientific Marxism and so on), which turned out to be even more oppressive than the original model. Communist technocrats were inspired by liberal technocrats, just as neoliberal technocrats are inspired, although indirectly, by communist technocrats. Communist technocrats were able to maintain long enough authoritarian political systems that repressed both market and democracy; neoliberal technocrats seemed to be inspired by their capacities and it is very possible that they aim to create new forms of political authoritarianism that are better in protecting market interests than the drifting liberal democracies of nowadays.

What would have Hegel said about this? While he would have certainly not agreed with Foucault's analyses of the state as mechanism of institutionalized oppression and neither with Heidegger's general skepticism towards modernity – he would nevertheless question the implicit influences of mathematics and physics upon contemporary neoliberal capitalism. It is worth mentioning that Hegel himself criticized the free market and the poverty it so constantly produces, looking towards the state in order to contain and diminish it as much as possible (Hegel 2003, 264-268; see also Buchwalter 2015).

Even if he constantly wars about the dangers of revolution, equated in his political philosophy with a rapture between particularity and reason, the universal (Hegel 2004, 269-270; Hegel 1984, 669-670), – when states have utmost failed to accomplish their fundamental mission of protecting and expanding civil liberties, Hegel ultimately concedes citizens

the right to revolt (Hegel 2011). In the last instance, philosophy cannot exist and prosper in the absence of political liberty (Hegel 1995b).

But what kind of philosophical and political liberties are possible in a mechanized world, a world which objectified man pretending to have set him free from the web of religious propaganda? What kind of liberties are possible in a world that converts qualities into quantities in order to function according to its own internal logic? What kind of liberties are possible in a world where mechanism has apparently triumphed over purpose, and necessity upon dialectical freedom? Be that as it is, Hegel's historical optimism is impossible to overcome. People are feeling more and more alienated with respect to this particular *status-quo*; the new generations are not satisfied with the answers given by older generations. They have to come up with their own (Hegel 1995a). Here lies the promise of a future non-mechanized world, a world in which technics will return to being an instrument of man and not, as Marx would have said, its false consciousness or better yet, in Hegelian terms, its impossible consciousness. A world in which mathematics would once again accept the guidance and superiority of philosophy.

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