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Algorithms and conceptual history

Resumen: *Este ensayo explora las interrogantes teóricas que surgen de la proliferación de formas de relación social mediadas digitalmente y su impacto en la constelación moderna de conceptos políticos y sociales. Aunque hace tiempo que varias disciplinas han empezado a abordar el impacto de la tecnología digital en sus objetos de estudio, la indagación sobre cómo muta la semántica de la política y la sociedad en contextos regulados por algoritmos sigue estando ausente del panorama de la historia de los conceptos. El ensayo pretende trazar una cartografía de los problemas teóricos que se derivan de ellos y que es necesario afrontar y discutir al abordar los márgenes tecnológicos de la historia conceptual. Para ello, en primer lugar, busca herramientas y respuestas en la obra de los fundadores de la Begriffsgeschichte, centrándose en particular en cómo se ha tratado el tema de la tecnología a la hora de sentar las bases de la historia conceptual. En segundo lugar, analiza algunas contribuciones que han tratado de responder a los enigmas expuestos anteriormente, estableciendo los primeros fragmentos de una historia conceptual de la política algorítmica en su vínculo con las transformaciones actuales del Estado.*

Palabras clave: *Historia conceptual, algoritmos, estudios críticos de datos, tecnología, neoliberalismo.*

Abstract: *This essay explores the theoretical questions emerging from the proliferation of digitally mediated forms of social intercourse and their impact on the modern constellation of political and social concepts. While several disciplines have long since begun to address the impact of digital technology on their objects of study, an inquiry into how the semantics of politics and society mutates within contexts regulated by algorithms is still all but absent from the landscape of the history of concepts. The essay aims at laying out a cartography of the theoretical problems that derive from them and that need to be faced and discussed when addressing the technological margins of conceptual history. First it does that by looking for tools and answers in the work of the founders of Begriffsgeschichte, focusing in particular on how the topic of technology has been treated in laying the grounds of conceptual history. Second, it discusses some contributions that have tried to answer to the conundrums exposed above, laying the first fragments of a conceptual history of 'algorithmic politics' in its link with the current transformations of State.*

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Keywords: *Conceptual history; algorithms; critical data studies; technology; neoliberalism.*

Introduction

This essay aims at contributing to the dossier dedicated to the margins of Conceptual History by exploring the theoretical questions emerging from the proliferation of digitally mediated forms of social intercourse and their impact on the modern constellation of political and social concepts. As Nick Couldry and Ulises A. Mejías maintain, the Internet is not simply a virtual supplement to the material world, but it «has reconstituted social space in a fundamental way» (2019, 21). And it has done so, by relying on a body of scientific methods and concepts, developing tools for a systematic quantification of every quality expressed in social life. Besides that, the architecture of digital platforms is composed through words that echo key concepts from the modern political, legal, and social lexicon: from social media to digital communities, from software that produces recognition to algorithmic codes, from informatic commands to artificial proxies. This fact opens up a set of questions about the ways in which the semantic content of these concepts changes when used to designate digitally mediated relationships and practices and to what extent they are still able to orient the actions of individuals and collectives. While several disciplines have long since begun to address the impact of digital technology on their objects of study, an inquiry into how the semantics of politics and society mutate within contexts regulated by algorithms is still all but absent from the landscape of the history of concepts[1]. This absence is not accidental but stems from the fact that the study of the semantics of what we can call provisionally 'algorithmic politics' presents a number of theoretical hurdles concerning two sets of problems that need to be mentioned by way of introduction. The first one relates to the historical relationship between politics and technology in general, and the second one has to do with the status of digital technology in contemporary times.

Langdon Winner maintains that politics and technology represent in modern history two domains that apparently follow two different logics (2020, 19-39). On the one hand, we have the semantic field of State politics; on the other hand, we encounter a sphere that appears depoliticized because it is supposed to work only according to operational effectiveness and practical goals, seemingly alien to the conflicting logics that belongs to the sphere of the political and entrusted to decisions not based on values but rather on competences. Due also to this separation, according to Hans Blumenberg, «die Sphäre der Technizität leidet unter Sprachnot, unter einem Kategoriendefekt» (2009, 27). Deprived of the legitimacy derived from science's own relationship with truth and, as an artifice, lacking the legitimacy associated with the concept of nature, technology is consigned to an exclusively operative fate, incapable of mattering except by virtue of its practical merits.

The separation of politics and technology has specific roots in the constitutional history of modernity but does not imply *per se* that the latter is alien to politics: there is a politics of technology that is not directly traceable to the institutional and representative framework of State politics and is opaque because it unfolds largely outside the public sphere. «The things we call 'technologies' are ways of building order in our world» (Winner 2020, 28) or, as Jasanoff puts it, «modern technological systems rival legal constitutions in their power to order and govern society» (2016, 9). The field of technology then does not simply denote the set of technical innovations, but a knowledge through which technologies build order, position individuals, and establish forms of domination, that in turn originate conflicts and resistances. In other words, technology is a strong constitutional factor, if we understand the constitution in a material sense as including not only the legal constitution, but the overall forces that shape a historical society.

In this view, technology is political in that it contributes to build the material constitution of society, a process that is not simply *technical* but has to do with how relationships of domination

are established, consolidated, and contested. This take is all the more useful today when institutions increasingly work by relying on algorithmic computation. If we base ourselves on the Western world, the proliferation of algorithms in several fields of State activity needs to be historicized and understood against the backdrop of the long end of the Welfare State, the demise of the figure of the citizen-worker holder of social rights, the crisis of representation, and the global assertion of neoliberalism, which has radically altered the forms of politics. Even the legal reach and territoriality of the State is challenged by the «nomos of the *cloud*» (Bratton 2015). In whatever ways one reads this long-lasting transformation, the first step to pose the question of the relationship between conceptual history and 'algorithmic politics' is exactly to look for politics within a field that has been historically de-politicized and opposed to what is properly political.

Within the field of science and technology study, an attempt to question the constitutional division between politics and technology has been pursued by Bruno Latour. Latour maintains that nowadays what contributes substantially to the durability of collectives are not social relationships of domination and the related ideological formations, but rather technologies and humans-nonhumans interactions (Latour 1990). The relevance of specific ideological formations able to signify, legitimize, or contest those relationships is denied, while politics as such is turned into one 'mode of existence' beside many others working with different tools towards the unification of collectives (Latour 2013). Technology is political for Latour because artefacts help assuring through their effects and interactions with humans the durability of associations, whereas the ways in which humans use concepts to make sense of those associations become irrelevant. The belief that «each concept establishes a particular horizon for potential experience and conceivable theory» (Koselleck 2004, 86), i.e., that concepts constitute the gateway to investigate structural connections that go beyond individual actions and contingent emergences is thus ruled out as bad metaphysics[2]. That «without common concepts there is no society, and above all, no political field of action» (Koselleck 2004, 76) is explicitly questioned by a Latourian perspective which recognizes that there is a politics of technology only by reducing the political to one set of procedure that characterize a type of connections among actants (Latour 2007). If the priority is to 'follow the actors' in their contingent collective formations, the possibility of a conceptual history of algorithmic politics seems ruled out.

Differently from this perspective, a conceptual history of algorithmic politics would need to ask what transformations the relationship between conceptual and constitutional and social history undergoes when a technology relying on codes and data redefines the relationship between concepts and society. As Carl Mitcham points out, while we can recognize that within any technological process there is knowledge implied, the nature of technology as knowledge takes on new meaning in the face of advances in the field of computation, because it is now knowledge itself that becomes the object of technical elaboration (Mitcham 1994, 192). Also for this reason, according to Roberto Finelli, we are not simply facing a new phase in the history of technology, but rather a «threshold where the technological artifact no longer seems to present itself as a tool, as it has traditionally been conceived, but becomes a kind of 'machinic subject'» (2022, 11). Algorithms are particular technical objects whose materiality is linked with a specific language that codes values and data on society to produce a prediction on probable future behaviors. This coding of social meanings and classification is part of the very technicity of algorithms, of the ways in which they contribute to structure the social order.

The reflection on conceptual history confronted with 'algorithmic politics' needs to overcome these two obstacles to begin with: it needs to look for politics within technology and to redefine the relationship between conceptual and social history, when confronted with a technology such as the algorithm that introduces meanings directly within the social infrastructure, trying to erase the distance between the technical apparatus and its ideological legitimation, producing what has been called a techno-ideology (Domingos 2015). In order to uncover

the historicity of this conflation of words with operations, of ideology, and technology, one does need to pose a series of relevant questions that are still in need of a serious answer: how do meanings 'enter' the language of the digital platforms? Who decides, defines, normalizes them? How do they encode identities, categorize differences, promote behaviors? In what forms do they perform normative functions and what is the relationship between them and the normativity of society itself? To what extent do these meanings modify subjectivities and are indices of new forms of power?

This essay does not claim to provide an answer to these questions. It simply aims at laying out a cartography of the theoretical problems that derive from them and that need to be faced and discussed when addressing the 'technological margins' of conceptual history. First, it does that by looking for tools and answers in the work of the 'founders' of *Begriffsgeschichte*, focusing in particular on how the topic of technology has been treated in laying the grounds of conceptual history. Second, it discusses some contributions that have tried to answer to the conundrums exposed above, laying the first fragments of a conceptual history of 'algorithmic politics'.

Conceptual History and Technology

If we look at the original configuration of the *Begriffsgeschichte*, technology is not the object of specific investigations. Proof of this is the fact that the lemma «Technologie» is absent from the *Geschichtliche Grundbegriffe*. If we take into account the orientation towards a structural social history that Otto Brunner and Werner Conze among others helped initiate, technology is nothing but a structural element. The result of the transition to the modern world is what Conze defines as the «technisierte Industriegesellschaft» (Conze 1957). Technicized industrial society is the outcome of that transformation inaugurated by the epochal threshold between the Eighteenth and Nineteenth centuries, where personal relations of domination are replaced by a political obligation structured according to the two interlacing processes of democratization and industrialization. A turn to a new form that for Conze consists of the inauguration of world history and the final end of Europe's centrality, which began in the Nineteenth century and was consummated by the two World Wars. A periodization that, in Brunnerian fashion, denies the canonical distinction between Middle Ages and Modernity, identifying three major epochs in human history: prehistory, the patriarchal age that lasted from 6,000 years back to the Eighteenth century, and the current technicized industrial society (Consolati 2020). In this new structural context, history is in danger of becoming impersonal, dominated by technological processes that threaten to turn humans into functions: a tendency that must be countered by that specifical combination of political and social history that was the breeding ground of the later *Begriffsgeschichte*. The political is understood as an unavoidable ingredient of the preservation of human decision-making capacity in front of a society dominated by technology, of giving human form to its anonymous process.

Even in the works of Reinhart Koselleck, who more than anyone else animated the project of a *Begriffsgeschichte*, technology is not directly thematized as a field of conceptual production, but the recurrence of the semantic field of technology plays a prominent role in the genesis of the contemporary world (Consolati 2023). During the composition of *Kritik und Krise*, in a letter to Carl Schmitt (Koselleck to Schmitt 1954, 66-69), Koselleck writes that the invention of technologies that can potentially destroy all humanity is the outcome of the inability to dominate historical events that he traces back to the Enlightenment and its philosophy of history. Due also to technical apparatuses independent from the decisions of individuals, the world crisis seems to escape any ability to be resolved politically. Politics and technology, in a Schmittian fashion, seem to be referring to two different fields. The technological issue gained quite different features in the social history of Prussian reforms in the early 19th century. In *Preussen zwischen Reform und Revolution*, technological innovation is primarily the driving force behind the industrialization of production resulting in the dismantling of the traditional system of arts

and crafts and the collapse of the social constitution in the countryside. In the time frame considered by Koselleck, the Prussian state comes to progressively relinquish control over nascent industry, conceding all technical superiority to the new bourgeoisie. This process runs parallel to the inability to provide responses to the growing poverty originating in Prussia's early industrial development. Koselleck does not say that this renunciation, which is accomplished in the *Vormärz*, coincides with the sinking of the project of a *Technologie* as a discipline governing over production as it had been conceived in the field of cameralism. As a matter of fact, the project of a general technology was designed in the late Eighteenth century by Johann Beckmann: technology originally means knowledge relating to the government of the arts as a whole, that is, the body of knowledge that the prince had to possess in order to effectively dominate the sphere of production (Frison 1993; Schatzberg 2018). From being a study of technical terms, that is, words that are specific property to people who are placed in a certain rank and engaged in a certain art (Zedlers 1731-1754, 508-509), in the late eighteenth century the term «comes alive again in the lexicon and conceptual vocabulary of modern Europe almost as a neologism, coined to baptize the project of a systematic knowledge concerning work, production, and techniques» and then presented itself in the early 19th century not only in Germany as the «unifying axis of a cultural renewal of the entrepreneurial classes» (Di Lisa 1986, 306), before disappearing for almost one century outclassed by the hegemony of political economy. The uneven destiny of the word is therefore tied with the similarly uneven history of the relationship between the State and the bourgeois laboratory.

In Koselleck's essays devoted to the theory of historical time, technology refers to something that makes political planning always delayed and partially effective: that is the theme of acceleration so peculiar to the contemporary experience of time. «In our modern age, as it is shaped by science, technology, and industry, the future in fact implies different and new things» (Koselleck 2002, 113), so much so that «it is technical progress, together with its consequences, that delivers the empirical basis for 'history pure and simple'» (Koselleck 2004, 96). What was thought merely possible in an imaginary elsewhere now becomes scientifically, technically, and economically feasible. History can be 'made', society can be organized: each is now called upon to take a stand on its form and direction. «Once acceleration was unleashed in interpersonal traffic, it could only be driven further once technological inventions allowed it to surpass nature-given limits. Only in the wake of the French and Industrial Revolution did acceleration begin to become a universal principle of experience» (Koselleck 2018, 87). Technology-driven acceleration intervenes in the space of experience and not in the horizon of expectation, so much so that even catastrophe becomes, with technical progress, no longer a transcendent but an empirical possibility. The acceleration that becomes experience invests the political and social world with an unstoppable democratic tension: «the enemies of the railroad recognized and feared the democratizing effect of the railroad, which transported all the existing estates in four classes at the same speed. It was a commonplace that the railroad initiated the age of equality» (Koselleck 2018, 87).

It is thus clear that the problem opened by technical progress is not simply that of the transition between two epochs, between the ancient society and industrial society, from one order to another. It introduces acceleration into the very structure of contemporaneity, making the differential between a before and an after a mobile criterion of distinction and hierarchy of historical experience. The idea so central to the mature Koselleck of the contemporaneity of the noncontemporary is, in fact, closely linked to the problem of technical progress and the theme of acceleration, which, as such, introduces a difference between anticipation and delay within the bosom of all historical experience, subjective, intergenerational and world-historical. There is, Koselleck writes, a specific non-contemporaneity due to technological evolution when looked at from a world perspective:

> One could think, for instance, of the enormous precedent of scientific, economic, and technical developments which, coming

> from England, spread to the United States and to many, but not all, European countries and finally to Japan. Measured against such precursors or trailblazers, all the remaining countries and peoples fall into their wake and have to catch up. They appear to be lagging behind, as developing countries. (Koselleck 2002, 159)

In an accelerated time, political planning aimed at catching up is constitutively lagging behind a forward technological movement that overtakes it, presenting the relationship between technology and politics as a constant tension of the latter to be synchronized with the former. From this Koselleck renews his critique of the idea that history can be 'made', and against what with Marx he calls «manufacturers of history» (Koselleck 2004, 201). Technology sustains the imagination of the feasibility of history as much as it constantly undermines it as a process over which no prognosis is effective. In this sense, it is no longer the machine or the clock the metaphor capable of describing the order of society, inhabited as it is by a geometric and no longer arithmetic progression. In this regard Koselleck quotes the publicist Johann Georg Büsch, who, speaking of the division of labor, writes, «I am not able to find an example in mechanics that can adequately capture this kind of interaction» (Koselleck 2004, 88). Society begins to be thought of as a machine of an entirely new kind, a computational machine, in accordance with an anticipation that would later be taken up in the mid-twentieth century in the field of cybernetics and artificial intelligence. Politics needs to adapt to the normativity of a society which is inherently moved by a technological logic that escapes any definitive planning.

The 'algorithmic turn' and the new social codes

In describing the current 'algorithmic turn', William Uricchio states that «in contrast to the precision, calculability and specificity of the algorismic» —that is a notion of mathematics as a language of calculability and predictability— «an algorithm refers to a process, a program with clearly defined limits, a finite instruction sequence» (Uricchio 2011, 26), that nonetheless introduces a third actor between subject and object. The subject is not anymore the fixed point of a three-dimensional perspective. The algorithmic turn influences the very relationship between subject and object, not least because it introduces a new mediator between the one and the other able to set the protocols according to which subjects can communicate with one another. Algorithms «have become sites of cultural and social production» (Bucher 2018, 150): they are ways of ordering and classifying the social world. One must then focus on how they program and govern sociality, producing the conditions through which individuals talk and connect with each other. If we want to assess the impact and magnitude of this so-called 'algorithmic turn' in comparison to the framework that Koselleck and before him Conze have laid out, we need first to understand the specific spatiality and temporality that this turn brings about.

Algorithmic politics moves into a sphere of signification that is by now fully transnational. While Conze, Brunner, and Koselleck, went back in time to find out the specific characteristics of the European path to modernity, in the moment when the European supremacy had crumbled, the spatial and historical framework in which digital platforms are effective occupies the entire space of what has been called the world-society. Conceptual history started from the assessment of the end of the geographical and historical centrality of Europe, while focusing on what is specifically European in front of the risk of losing one's own identity in the face of technological progress on a world scale. Now the provincialization of Europe can be declared concluded and the planetary devices of computation be considered one of the most powerful transnational agents offering themselves to the analysis. The philosopher of technology Huk Yui (2016) speaks in this regard of a «technological globalization» (81), of a planetary technological organism. Benjamin Bratton describes this world structure as a 'stack' that would replace the physical and political geography of the globe with a new non-state political spatiality whose architecture is computational

(Bratton 2016). In this way the question around what kind of conceptual analysis we can provide for 'algorithmic politics' interlaces deeply with several attempts in direction of 'globalizing' conceptual history.

Besides a different spatiality, the lexicon of politics, when inserted into the algorithmic grammar of digital platforms, reveals a different temporality than the one outlined by Koselleck referring to 'acceleration' as connected to the belief that history can be manufactured, to the impossibility of effective planning technical progress and to the idea that the future will be different from the past. Many analysts of algorithms have highlighted how they entail a specific way of designing the connection between past, present, and future. In order to infer the correlation of certain categories, algorithms derive the probability of future correlations from the frequency of past correlations. In this, as critical algorithm studies have pointed out, they contribute to reproduce forms of oppression and hierarchies within society because they push for the continuity of a certain state of being from the past to the future. Contrarily from modern temporality where the future is open and different from the past, algorithms seem to infer that the future cannot be different from the past. A kind of temporality that bears a series of affinities with the so-called «presentism» of neoliberal societies (Hartog 2015).

In order for these inferences from past behaviors to probable future ones to be made, entire fields of social knowledge are mobilized. Far from introducing absolute novelties, Wendy Chun demonstrates the extent to which methods of data analysis and correlation echo methods and purposes of older disciplines such as eugenics and sociometry, but also of cybernetic theory according to which an entity's identity is derived from its persistence in a certain pattern of behavior and authenticity means the repetition of predictable attitudes (Chun 2021). These assumptions around regularities of behaviors, changes the ways in which order and power are understood. Taina Bucher points out that algorithmic power strains the modern concept of government because it unfolds immanently through the relations it promotes, so much so that she finds there an analogy with the Foucauldian category of governmentality, as a process within which meanings and with them subjects are produced and reproduced (Bucher 2018). In this regard, philosopher of law Antoinette Rouvroy also speaks of algorithmic governmentality, focusing mainly on the epistemic aspects and the crisis of the regime of truth caused by algorithmic computation (Rouvroy 2011). In the context of planetary computation, things now seem to «speak for themselves»: the «meaning-laden reality is replaced by a series of meaningless data that function as signals ... to be computable» (Rouvroy and Stiegler 2016, 21). This produces a profound change in the status of knowledge, for it seems that we no longer need to produce knowledge about the world and can discover knowledge directly within the world as if conceptual history was now embedded within social history itself. In parallel, «it becomes possible to shape the social directly in the social» and «to govern without deciding» (23), bringing about a fundamental shift in the relationship between technology and politics.

It is at the intersection of the new algorithmic constitution of the social and the redefinition of the relationship between design and operation, will and action, decision and procedure, governance and governmentality that the algorithm has emerged as a technical object deserving its own history and political theory. With the aim of laying the groundwork for a political theory of algorithms, David Panagia invites a focus on algorithms as objects that govern everyday life. Algorithmic power consists, in fact, in a continuous decomposition and recomposition of data, which «measure weights and values that in turn generate world relations that are neither indexical nor analogical, but virtual» (Panagia 2021, 117). Against this background, the morphology of political concepts cannot disregard the mode of existence of the specific technical means through which they convey meanings. Not so much a site of production of new concepts, the algorithms is rather an operation that bestows on existing concepts a specific semantic shift and endows them with a specific temporality. To investigate the *dispositional power* of algorithms, Panagia is not alone in looking at cybernetics, that is,

the 'prehistory' of artificial intelligence. Panagia points out that cybernetic governance is the key to understanding the political features of the algorithmic object. It functions to maintain homeostasis despite variations or resistance posed by an external environment, which is neither plannable nor knowable, but with respect to which constant adaptation is presupposed. Therefore, Panagia writes, cybernetics rather than a science of control and communication is a political philosophy of engineering for the disposition of energies which, on the basis of entropy physics, information theory, and behaviorist psychology intends «to transform everyday life into a political physics of life processes» (Panagia 2021, 124).

Apparently making a big leap, Panagia thus compares the negative feedback mechanism to Thomas Hobbes' social pact as a device certifying the unification of individuals on the basis of the political order. As in Hobbes, submission to Leviathan demands the mimetic 'technology' of the covenant, so cyberneticians «believe that there can be neither message nor meaning without negative feedback, that is, without the mechanism that creates the necessary conditions of low entropy» (Panagia 2021, 126). However, this is, in the case of cybernetics, an order that arises without the conscious will of the subjects and claims to do without an authoritative center that issues the command, placing it instead within the functioning of the system itself as a constant adaptation with respect to the external environment. Algorithmic power would constitute an outgrowth of this mutation of the logic of command and its lexicon, a specific mode of governance whose secret is the very possibility of intervening technologically in society and doing so according to mechanisms of adaptation that in changing constantly confirm the hierarchical structures of the whole. In algorithmic functioning is condensed not only the social knowledge of those who program the algorithms, not only the knowledge of those disciplines that make the quantification of the social the basis of their methods, but also a specific representation of the social as a sphere governed by homeostasis in which individuals follow patterns of behavior that can be predicted since they do not depend on voluntary choices but on contingent responses to external stimuli. Through algorithmic computation, therefore, a representation of the social that is different from and in conflict with modern political representation is at work, redefining the nature and coordinates of the latter.

It is no coincidence, moreover, that it was precisely the theorists of neo-liberalism —first and foremost Friedrich von Hayek— who referred to cybernetics to understand the workings of the market and from there started to rethink the scope and purpose of politics. According to Hayek, the feedback mechanism can be applied to the price system and implies that it is impossible for the individual to have an overall knowledge of how the market works. The goal is to be able to «dispense with the need for conscious control» and understand «how to provide inducements which will make the individuals do the desirable things without anyone having to tell them what to do» (Hayek 1945, 527). Policy cannot control or plan, but it must be able to 'cultivate' those rules that emerge from the market interactions themselves from the signs and information that can be captured in the fluctuations of the price system. Politics is not transparency, the place for conscious decisions, but moves within the rules that emerge in the market order, adapts to them, and guarantees them. That failure of planning that Koselleck denounced as a tension at the heart of the modern relationship between technology and politics, becomes for Hayek the very starting point of a different understanding of politics. Rather than taking for granted the unpolitical nature of technology as such, one can place the apparently only operative logistics of cybernetics and algorithmic operations as allies of the aim of the neo-liberal doctrine to depoliticize the social as the goal of a vast operation of transnational institutional design, with clear conceptual and ideological tenets (Slobodian 2018). Rather than the political being, as it was at least partially for Conze and Koselleck, a reservoir of subjective capacity to decide, now the study of political concepts needs to come to terms with logics and strategies that have for decades invested the public sphere and the territoriality of states, marking profound transformations of decision-making processes, democracy and representation. The

study of 'algorithmic politics' and its linguistic apparatus can be exactly an entry point to these transformations.

Notes

1. To the so-called 'digital constellation' is dedicated the latest issue of *Zeitschrift für Politikwissenschaft* (vol. 32, no. 2, 2022, «Political Theory and the Digital Constellation») whose editors denounce an important delay on the part of the history of ideas and political theory in dealing with algorithmic innovation. In the issue of *Geschichte und Gesellschaft* devoted to «Neue Wege der Begriffsgeschichte», the only essay that refers to algorithmic innovation is dedicated to the application of digital methods to the study of historical sources. See Silke Schwandt. 2018. «Digitale Methoden für die historische Semantik: Auf den Spuren von Begriffen in Digitalen Korpora». *Geschichte und Gesellschaft 44*, no. 1: 107-34.
2. Cfr. Joerges, Benward and Helga Nowotny. 2003. *Social Studies of Science and Technology. Looking Back, Ahead*. Dordrecht: Springer.

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