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Matthew Handelman: The Mathematical Imagination: On the Origins and Promise of Critical Theory

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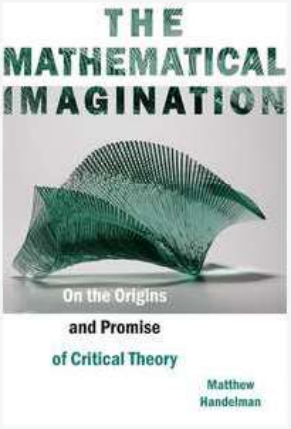

The Mathematical Imagination focuses on the role of mathematics and digital technologies in critical theory of culture. This book belongs to the history of ideas rather than to that of mathematics proper since it treats it on a metaphorical level to express phenomena of silence or discontinuity. In order to bring more readability and clarity to the non-specialist readers, I firstly present the essential concepts, background, and objectives of his book.

The methodology of this book is constructed on the discussion of concepts and theoretical perspectives such as *Critical Theory*, N*egative Mathematics*, *Infinitesimal Calculus*, expression and signification of silence and contradictions in language. Borrowed from the mathematics or from the thinkers of the Frankfurt School, each of these concepts becomes refined, revisited and transposed by Handelman in order to become operative outside of their usual context or philosophical domain. The term *Critical Theory* was developed by several generations of German philosophers and social theorists in the Marxist tradition known as the Frankfurt School. According to these theorists, a *critical theory* may be distinguished from a traditional theory as it seeks human emancipation from slavery, acts as a liberating tool, and works to create a world that satisfies the needs and powers of human beings (Horkheimer 1972). Handelman revisits what he calls a "negative mathematics": a type of mathematical reasoning that deals productively with phenomena that cannot be fully represented by language and history, illuminating a path forward for *critical theory* in the field we know today as the digital humanities.

In *The Mathematical Imagination*, *negative mathematics* encapsulates infinitesimal calculation, logic and projective geometry as developed by Gershom Scholem (1897-1982), Franz Rosenzweig (1886-1929), and Siegfried Kracauer (1889-1966). These three German-Jewish intellectuals were connected to the thinkers of the Frankfurt School but distinct because they found ways to use math in their cultural theory. The *negative mathematics* found in the theories of Scholem, Kracauer or Rosenzweig (inspired by their famous predecessors Salomon Maimon (1753-1800), Moses Mendelsohn (1729-1786) and Hermann Cohen (1842-1918)), are not synonymous with the concept of negative numbers or the negative connotation of math that we see in the works of the other members of the Frankfurt School.

Handelman's objective is to present his book on the path of Scholem, Kracauer and Rosenzweig using math and digital technology as a powerful line of intervention in culture and aesthetics. *The Mathematical Imagination* investigates mostly the position of these three German Jewish writers of the XX century concerning the relationship between mathematics, language, history, redemption, and culture in the XX century and extending his analysis to digital humanities. Mathematics is convened metaphorically in their theory of culture as pathways to realizing the enlightenment promises of inclusion and emancipation. The silence of

mathematical reasoning is not represented by language but by the negative approach that is to say absence, lack, privation, discontinuity or division like in the conception of the infinite. One example of this productive negativity is to look at how mathematics develops concepts and symbols to address ideas that human cognition and language cannot properly grasp or represent, and surfs metaphorically with the concept of the infinite (Monnoyeur 2011, 2013). The infinite calculation is a generative spark for theorizing the influence of math in culture as differentials represent a medium between experience and thought. For Scholem, Rosenzweig, and Kracauer, these mathematical approaches provide new paths for theorizing culture and art anew, where traditional modes of philosophical and theological thought do not apply to modern life or situation of exile.

In *The Mathematical Imagination*, Matthew Handelman wants to give legitimacy to the undeveloped potential of mathematics and digital technology to negotiate social and cultural crises. Going back to the Jewish thinkers of the Weimar Republic, namely Scholem, Rosenzweig and Kraucauer, he shows how they found in mathematical approaches strategies to capture the marginalized experiences and perspectives of German Jews in Germany or exile at the beginning of the XX century. In doing so, he re-examines the *critical theory* of the Frankfurt School, specifically those philosophers who perceived in the mathematization of reason a progression into a dangerous positivism and an explanation for the barbarism of World War II. Handelman re-evaluates Adorno and Horkheimer's conception of mathematics, according to which math should not be treated as a universal science able to solve any problem because it is not able to rule the human world of culture, art and philosophy. For them, as for Adam Kirsch, who wrote in 2014 the article "Technology Is Taking Over English Departments" (published in *New Republic*), both mathematical and computational mechanization of thought exclude the synthetic moment of the intellect and cannot produce new or meaningful results.

The first chapter, titled "The Trouble with Logical Positivism: Max Horkheimer, Theodor W. Adorno, and the Origins of Critical Theory," recounts the debate that took place between the members of the Frankfurt School — Max Horkheimer (1895-1973), Walter Benjamin (1892-1940), Theodor W. Adorno (1903-1969)—, and members of the Vienna Circle, such as Otto Neurath (1882-1945) and Rudolf Carnap (1891-1970). Mathematics, according to the Frankfurt School's *critical theory*, is in apparent opposition to language, since there is a dialectical tension between two forms of thought, one expressed in mathematics that circumvents representation and the other mediated by language and representation. Adorno gave, through the tension between mathematics and other forms of knowledge, the political dimension that we find in his works and his confrontation with the Vienna Circle. For Adorno, the attempt in mathematics to abandon meaning, the ability to signify something else, constitutes the philosophical flaw of the logical positivists' proposal to reduce thought to mathematics.

The second chapter, titled "The Philosophy of Mathematics: Privation and Representation in Gershom Scholem's Negative Aesthetics," revisits the relation between language and mathematics in the context of Kabbalist culture. In his writings on the language of lamentation, "On Lament and Lamentation," Scholem explores the dilemma of saying the ineffable and the oscillations between spoken and unspoken language, in order to reconcile the paradoxes inherent in language (Scholem, 2014). At the heart of these paradoxes lies the deep dialectic between openness and secret, concealment and revelation. He underlines a common privative structure of communication in mathematics and laments that it negatively communicates language's own limits, but it also reveals an aesthetic strategy. For Scholem, the philosophy of math deals with the problem of language by omitting its representation, and its inexpressibility represents the privation of life in exile with the possibility to recover a productive vision of mathematics. Math is done to speak purity, privation, a language without representation, and it deals with the shortcomings of language. According to Gershom Scholem, this fruitful approach lies beyond language within the sphere defined by the signs of mathematical logic. Scholem understands math, history, and tradition metaphorically, as characterized by silences and erasures that pave the way for the acknowledgment of historical experiences and cultural practices which rationalist discourses, majority cultures, and national, world-historical narratives may marginalize, forget, or deny.

The third chapter analyses the relation between infinitesimal calculus and subjectivity/motion in Franz Rosenzweig's Messianism. Rosenzweig's (1886-1929) major work, *The Star of Redemption* (1921), is a description of the relationships between God, humanity, and the world, as they are connected by creation, revelation, and redemption. He is critical of any attempt to replace actual human existence with an ideal and, for him, revelation arises not in metaphysics but in *the here and now*. He understands knowledge not as what is absolutely proven, but rather what individuals and groups have verified through their experience. For Rosenzweig, verification did not mean that ideas substantiated in experience automatically counted as knowledge; neither does it imply that theoretical statements become meaningful when verified by experience, as Carnap later argued. He analyzes thus how concepts such as subjectivity, time, and redemption are central to critical theory and avoided by the official languages of philosophy and theology. Rosenzweig's thought is an example of how cultural criticism can borrow from mathematics to illuminate its concepts without mathematizing culture. For instance, the way infinitesimal calculus linked nothingness with finitude represented a tool that could be used to reorient epistemology around the individual subject. For him, mathematics possesses the ability to resolve a fundamental problem for both theology and philosophy, which is the creation of something from nothing. Calculus is motion over rest, reveals multiplicities of subjectivity and representation, and shows how the theoretical work done by mathematics offers epistemological tools useful for cultural criticism. These tools

could help theorists to think through concepts that remain obscure in aesthetics and cultural theory, as fractal geometry illuminates the theory of the novelty. Mathematics helps us to construct more capacious versions of these concepts as well, and conceptual tools exist that allow us to intervene more immediately in a project of emancipation, in the service of theories of culture and art, and where they are at work.

Chapter fourth presents geometrical projection and space in Siegfried Kracauer's Aesthetics. In *The Mass Ornament*, written in 1921 but published in 1960, Siegfried Kracauer reads the ephemeral unnoticed and culturally marginalized phenomena of *everyday city life* as an ornament. His attention to the quotidian leads him to decipher in urban life a hidden subtext referring to biblical figures that comfort his experience of intellectual exile. Improvisation constitutes a key category in Kracauer's critical engagement with metropolitan experience and modern culture; improvisation, with its invocation and representation, lies at the confluence of Kracauer's preoccupation, the contemporary cityscape. In this book, he decodes the surface meanings of the new city phenomena in their shallowness, personal and political significance. These collected essays dream wild about the ultimate meaning of the banal and the beautiful in cities and gather a diverse range of observations such as boredom and bullfights, dance crazes and detective novels, to reviews of sociology, theology and Biblical translation. *The Mass Ornament* offers an opportunity to reflect historically on culture and connects the theoretical or philosophical discourse to the passing flux of fashion and the inexorable demands of quotidian life in the city. As a report from the past, this book invites us to renewed reflection on the relation between theory and history, fashion and tradition. Kracauer, in relation to the entire range of cultural phenomena, includes fascinating portions of history and situates man's relation to society and time. By rearranging the language and textual space as a projection of rationalization, Kracauer explores the point of transference where geometric projection and the metaphors of space become a natural geometry in cultural critique. For Kracauer, geometry is a bridge across void because the mathematical study of space bridges the void between material reality and pure reason. The logic of mathematics informed his readings of mass culture, which sought to advance, rather than oppose, the project of the Enlightenment. For him, geometry enabled a literary approach to cultural critique in which the work of the critique helped to confront the contradictions of modernity and, through such confrontation, potentially resolve them. In *The Mass Ornament*, geometric projection turned into a political mode of cultural critique, projection, and the metaphors of space became aesthetically operative in the exploration of the rationalized spaces of the modern city.

In his final historical book, titled *The Last Things Before the Last* (1969), Kracauer presents mathematics as a web of relationships between elements abstracted from nature (Kracauer, 1969). The surfaces Kracauer describes are not an objective

reality in the sense of the natural sciences describe them; surfaces exhibit innate breaking points built into by the phenomenology of his approach of a reality stripped of meaning. For Kracauer, the study of history had to mediate between the contingency of its subject matter and the logic of the natural sciences. Nonetheless, this type of cultural critique, enabled by *negative mathematics,* must resonate with those of us who live in a world of new media, one ever more mediated and controlled by computers and other digital technologies. Kracauer assessed popular culture on its own terms, with a mind open to new technology and communications, and articulated a still valid critique of popular culture.

In his last chapter, titled: "Who's Afraid of Mathematics? Critical Theory in the Digital Age," Handelman concludes that digital technology with textual analysis is engaged in social emancipation and can give an answer to the crisis in the humanities. In his analysis of Gershom Scholem, Franz Rosenzweig, and Siegfried Kracauer's project, he develops the concept of *Negative Mathematics* in the tradition of Maimon, Mendelson, and Cohen to show how certain mathematical features and concepts can express the unexpressed part of language. In this endeavor, he focuses on infinitesimal calculation and reveals how culture, emancipation and social life can benefit from mathematics. That is to say, the seemingly tautological repetition of mathematics or digital technologies can act as a cultural aesthetics and interpretative medium. Handelman considers that mathematics and digital technology are by nature able to be a tool of liberation and emancipation if a good use is made of them. According to Handelman, if *critical theory* accepts the way Horkheimer and Adorno associate mathematics with instrumental reason and politics of domination, it risks giving up the critical potential of mathematics and any other interpretive tool such as technology or computer science.

Handelman poses the question: what happens if we allow mathematics to speak with analogy and image, to work with the *integral* of tradition, the *continuity* and *derivative* of truth? What if we applied mathematics more directly to cultural criticism? What possibilities, if not also, dangers, arise in using mathematics as an instrument of cultural thought?

Conclusion

Handelman's choice to focus on Scholem, Rosenzweig, and Kracauer's approach to mathematics in order to reveal pathways through the apparent philosophical impasse and an opportunity to realize the Enlightenment promise of inclusion and emancipation is exhilarating. His endeavor to build on the thought of these three lesser-known German-Jewish intellectuals of the interwar period can help move today's debates that pit the humanities against the sciences. By locating in mathematics a style of reasoning that deals productively with something that cannot be wholly represented by language and history, *The Mathematical*

Imagination illuminates a path forward for *critical theory* in the field we know today as the digital humanities. Furthermore, this volume explores mathematics as more than just a tool of calculation but one that is a metaphorically powerful mode for aesthetics and cultural analysis. Handelman reintroduces *critical theory* in the benefice of mathematics as access to culture and expression of the inexpressible. In other words, Handelman revitalizes a forgotten field of research at the intersection of language, math, history, and redemption, so as to capture the irrepresentable presence and interpretation of the complementarity of silence, and the language to express what was forgotten by the official language and culture. He also questions Adorno and other members of the Frankfurt School as unremitting opponents to mathematics. Instead, *negative mathematics* offers a complement to the type of productive negativity that Adorno, in particular, had located originally in the Hegelian dialectic. *Negative mathematics* reveals prospects for aesthetics and cultural theory neither as a result of being opposed to language, as Adorno and Horkheimer suggested, nor because it uses the trajectory of history or the limit of tradition. Instead, *negative mathematics* constitutes its own epistemological realm alongside history and mysticism, illuminating, based on its problematic relationship to language, in the dark corners and hidden pathways of representation. In this sense, it is positive because it deals successfully with what cannot appear in normal use of language or disappears behind official discourse. To this point, Handelman maybe meets the critical and social purpose of the Frankfurt School and fulfills his ambition to produce a theory both critical and mathematical, and even digital. If we take the Frankfurt School main critique regarding mathematics, according to which mathematical and computational mechanization of thought excludes the synthetic moment of the intellect and thus cannot produce new or meaningful results, we have to question then if Handelman's *negative mathematics* can actually produce new and meaningful results? Handelman's *negative mathematics* does not propose a general way to social critique as a block but rather opens space for the expression of what is suppressed, forgotten, hidden or impossible to realize because of official culture. Silences, disruption, movement, fashion, improvisation, news and materiality occupy the world of culture and are brought to existence by adapted mathematical processes. In this sense, the special treatment of mathematics does not repress the synthetic moment of the intellect but gives a voice to what could not exist before. Common, traditional, usual and politically dominant ideologies cannot resist or foresee this new critical mathematical cultural theory. Of course, this perspective is limited and is not enough to prepare a general critique of society as the thinkers of the Frankfurt School pursued it but improves significantly cultural and critical analysis.

Matthew Handelman noticed that many humanists nowadays have turned to mathematics and digital technologies and tries to forge new paths for modernizing and reinvigorating humanistic inquiry. *The Mathematical Imagination* presents mathematics and digital technologies as providing a key to unlock the critical

possibilities hidden in language to give a voice to silenced communities. Handelman's book improves cultural and critical analysis, and results into a new and thought-provoking *Critical Theory* bridging humanities and digital/mathematical technologies. His methodology and ideology are deliberately provocative, and he intends to develop a post-academic approach to fix the weaknesses of traditional and official discourse. His endeavor is also fruitful from the perspective of the history of the science as it shows the relation between various mathematical processes, such as the infinitesimal calculation and everyday phenomena that remain unexplored.

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Tuesday January 28th, 2020 Françoise Monnoyeur Reviews Gershom Scholem, Logical Positivism, Mathematical Imagination, Mathematics, Max Horkheimer, Siegfried Kracauer, Subjectivity, Theodor Adorno

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