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Hermann Cohen's *Das Princip der Infinitesimal-Methode:* The history of an unsuccessful book

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ABSTRACT

This paper offers an introduction to Hermann Cohen's *Das Princip der Infinitesimal-Methode* (1883), and recounts the history of its controversial reception by Cohen's early sympathizers, who would become the so-called 'Marburg school' of Neo-Kantianism, as well as the reactions it provoked outside this group. By dissecting the ambiguous attitudes of the best-known representatives of the school (Paul Natorp and Ernst Cassirer), as well as those of several minor figures (August Stadler, Kurd Lasswitz, Dimitry Gawronsky, etc.), this paper shows that *Das Princip der Infinitesimal-Methode* is a *unicum* in the history of philosophy: it represents a strange case of an unsuccessful book's enduring influence. The "puzzle of Cohen's *Infinitesimalmethode*," as we will call it, can be solved by looking beyond the scholarly results of the book, and instead focusing on the style of philosophy it exemplified. Moreover, the paper shows that Cohen never supported, but instead explicitly opposed, the doctrine of the centrality of the 'concept of function', with which Marburg Neo-Kantianism is usually associated.

1. Introduction

Hermann Cohen's *Das Princip der Infinitesimal-Methode* (Cohen, 1883) was undoubtedly an unsuccessful book. Its devastating reviews are customarily mentioned in the literature, but less known and perhaps more significant, is the lukewarm, and sometimes even hostile, reception the book received from Cohen's early sympathizers. Some members of the group dissented publicly, while others expressed their discomfort in private correspondence. Nevertheless, *Das Princip der Infinitesimal-Methode* has been enormously influential in the history of Neo-Kantianism. Despite its cumbersome style and shaky conclusions, the book seems to have emanated an almost totemic aura inside the little group of scholars gathered around Cohen, which, at the turn of the century, would become the 'Marburg school'. While the members could not endorse Cohen's results without reservations, caveats, or qualifications, they still had to defend the book from attacks and sarcastic comments coming from outside Marburg, as though the identity of the entire school were being threatened. To use Gregory B. Moynahan's expression, one could call the surprising impact of this fundamentally unsuccessful book "the puzzle of Cohen's *Infinitesimalmethode*" (Moynahan, 2003, 3).

This paper was written with the conviction that the time is now ripe to address, if not solve, this puzzle. In the last several decades, interest in Marburg Neo-Kantianism seems to have spread to English-speaking historiography of philosophy (Makkreel & Luft, 2010). Historians focusing on German post-Kantian philosophy have begun to extend their interests beyond the golden age of classical idealism (Beiser, 2014). Those working on the emergence of twentieth-century philosophy of science have dedicated increasing attention to the role played by the Marburg school (cf. e.g., Friedman, 2000, 2010; Heis, 2011; Ryckman, 2005). Scholars often seem to unilaterally focus on Ernst Cassirer and sometimes Paul Natorp—the other leading Marburg figures—but the translation of Andrea Poma's monograph (Poma, 1997) has reintroduced Cohen's work into the discussion. Recently, even *Das Princip der Infinitesimal-Methode* itself has attracted some interest, from the perspective of the history of ideas and culture (Moynahan, 2003), of the history of philosophy (Edgar, 2014) and also the philosophy of

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mathematics (Mormann & Katz, 2013). However, as far I can see, the literature still needs a detailed reconstruction of the path that led Cohen to write *Das Princip der Infinitesimal-Methode,* and more importantly, a history of its reception among both the 'big shots' of the Marburg community, and the minor but relevant figures gravitating around Cohen at the time (even if Schulthess, 1984 is still an invaluable source). The present paper seeks to fill this gap, and to offer tools to chip away at, if not quite break through, the infamous impenetrability of Cohen's prose.

This paper will hew to the following chronology. After an early attempt to read Kant's principle of the Anticipations of Perception through the lens of nineteenth-century psychophysics, at the turn of the 1880s Cohen (1883) became convinced that he should change course and try to understand Kant's second principle by historically reconstructing the discovery of the infinitesimal calculus (Section 1). Despite the negative reception of *Das Princip der Infinitesimal-Methode* both within the Marburg community and outside of it (Section 2), in the late 1880s Kurd Lasswitz (1890) adopted Cohen's approach in his own historical research, with some success (Section 3). Although Cohen (1896) was less than enthusiastic, at the turn of the century Lasswitz's insight was echoed in the young Cassirer's Leibniz monograph (Cassirer, 1902). In this book, despite using Cohen's language, Cassirer could not hide his dissent (Section 4). After the publication of the first volume of Cohen's system of philosophy (Cohen, 1902), by the 1910s the Marburg community seems to have split into two factions—an orthodox Cohenian front represented by Dimitry Gawronsky (1910), and a critical front containing the most representative members of the school, Natorp (1910) and Cassirer (1910) (Section 5). Cohen himself did not fail to notice the latter fact. By the time of Cohen's retirement in 1912, the school, while celebrating his work, was rife with internal tensions and conflict, a portentous sign of its decline (Section 6).

In retrospect, *Das Princip der Infinitesimal-Methode* seems to have been an unsuccessful book with a small and controversial legacy. Outside Neo-Kantian circles it never rose to the status of a respected monograph on the history and philosophy of the differential calculus, in contrast to other products of the Neo-Kantian historiography of science (Cassirer, 1906a, 1907a; Lasswitz, 1890). In addition, within the Marburg community, Cohen's philosophy of the infinitesimal calculus seems to have been a source of embarrassment. Even the most sympathetic readers were puzzled by Cohen's mystical use of the 'differential' dx as the *origin* of the finite quantitative difference x. As in mainstream presentations of the calculus, they insisted, Cohen should have emphasized the role of the differential quotient dy/dx, in which the *relation* between the finite differences y/x is preserved even when they vanish. After all, as Natorp and Cassirer pointed out, among others, this is the clearest historical example of the fact that in the exact sciences the relations are independent from the *relata*. For those who are used to considering this the core tenet of Marburg Neo-Kantianism, it might come as a surprise that this was not the message Cohen wanted to convey—as some of his other students, like Gawronsky, did not fail to realize. Thus, paradoxically, *Das Princip der Infinitesimal-Methode* played no role—or possibly just the role of a hindrance—in the emergence of the opposition between the 'concept of function' and the 'concept of substance', which Cassirer made a trademark of the Marburg School as a whole.

Nevertheless, *Das Princip der Infinitesimal-Methode* was an undeniably influential book, and its towering presence has loomed over the entire history of Marburg Neo-Kantianism. 'The puzzle of Cohen's *Infinitesimalmethode*' (Moynahan, 2003), as we will try to show, can easily be explained if one looks beyond the book itself, and instead focuses on the philosophical style it exemplified. "The special study of the infinitesimal principle," as Natorp recognized in a famous 1912 article celebrating the Marburg school, "reveals in a single glimpse the philosophical depth of [Cohen's] concern with the history of the exact sciences" (Natorp, 1912, 195). It is this detailed attention to the history of science that can be found again and again in Natorp's studies on Descartes, Galileo, etc., in Cassirer's great historical monographs, and in the works of many other minor figures. "Every contribution our school has made since then to the history and critique of the sciences," Natorp concluded rhetorically, though not without sincerity, "was the fruit of Cohen's inspiration" (Natorp, 1912, 195).

2. The history of the infinitesimal method: from *Das Princip der Infinitesimal-Methode* to the Second Edition of *Kants Theorie der Erfahrung*

On 24 February 1881, Cohen wrote to August Stadler—one his early followers from the time he was a young *Privatdozent* in Berlin in the 1870s (cf. Cohen, 1910)—that he "outlined a formulation of the Anticipations" in which Stadler's "previous concerns seem to be acknowledged and at the same time eliminated" (Cohen to Stadler, 24. Feb. 1881; Cohen, 2015, 128-129). In the previous decade Cohen had attempted to read Kant's principle of the Anticipations of Perception (A, 166-177; B, 207-218)—the second of the four principles of pure understanding listed in the *Kritik der reinen Vernunft*—against the background of psychophysics (Cohen, 1871, 215-216), the emerging nineteenth-century science that attempted to measure the intensive magnitude of sensations, by assuming that the latter are a continuous function of the stimuli producing them (Fechner, 1860; see the classical Heidelberger, 2004, for more details). In the second edition of the *Kritik*, the Anticipations of Perception attribute *a priori* to the 'real, which is an object of the sensation'[1] (B, 207) an intensive magnitude, which can increase or decrease continuously (B, 210-212). In the first edition, in contrast, the intensive magnitude seems to be attributed to sensation itself (A, 166). In Cohen's reading, Kant's new formulation was motivated by the need to indicate the 'real' as an objective correlate of sensation that exerts an influence on the senses, something that would play the role of the 'stimulus' in modern empirical psychology (Cohen, 1871, 215-216).

Stadler accepted this psychological reading of the Anticipations of Perception, although he was critical of Kant's *a priori* claims about the continuity of the intensive magnitude of sensation (Stadler, 1876, chap. 8). However, Stadler also forcefully denied that psychophysics (Stadler, 1878) could vindicate *a posteriori* what Kant was unable to prove *a priori* (Stadler, 1880, 585-586). Cohen's early students in Marburg addressed the question of the measurability of sensation (Darrigol, 2003) within the same framework. Adolf Elsas, a physicist by training, won a 1880 philosophical *Preisaufgabe* suggested by Cohen on the relationship between Kant's Anticipations of Perception and psychophysics (Sieg, 1994, 130f. and Holzhey, 1986, 1:381f.)—and Ferdinand August Müller wrote a dissertation on the topic under Cohen's guidance (Müller, 1882; see Heidelberger, 2004, 215ff. and 229ff. for further details).

Cohen's letter to Stadler reveals that at the beginning of 1881, at the latest, he must have realized that this approach had to be abandoned. Cohen agreed with Stadler's criticism of psychophysics (Stadler, 1880, 585-586); however he had clearly become convinced that the issue was deeper. It was not the intensive magnitude of psychological quantities that was at stake in the Anticipations of

[1] Kant distinguishes elsewhere between the 'reality that is the object of sensation' (*realitas phaenomenon*) from the 'reality that is the object of understanding' (*realitas noumenon*). Cf., e.g., Ak. 28:559. On Kant's usage of the terms 'real' and 'reality', see below fn. 3.