24. Carnap and Reichenbach

Hans Reichenbach (1891-1953) was a German scientific philosopher and founder of the Berlin Society for Empirical Philosophy. He was one of the leading logical empiricists and helped spread the movement to Turkey and North America after the Nazi government dismissed him from his position at the University of Berlin. His major works include *Philosophie der Raum-Zeit-Lehre* (1928), *Wahrscheinlichkeitslehre* (1935), and his more popular *Experience and Prediction* (1938) which provides an overview and introduction to his "probabilistic empiricism" (p. viii). Reichenbach's contributions to probability, epistemology, and philosophy of physics were closely studied by Carnap, who regarded him as his "best critic" (Carnap 1963, 14). The two had similar conceptions of philosophy but disagreed about the details, witnessing their frequent discussions and voluminous correspondence.

Carnap's and Reichenbach's lives bear a remarkable resemblance. The two were born four months apart and were active members of the German Youth Movement. They both attended the founding meeting of the *Freideutsche Jugend* (Sandner 2022), they both served in the German army during World War I, and they were both active in socialist organizations in the late 1910s. Carnap joined the Independent Socialist Party and started the underground *Political Circular* (Leitgeb & Carus 2020). Reichenbach published socialist pamphlets that would almost cost him a professorship when he applied at the University of Berlin in 1925 (Reichenbach 1918; Hecht & Hoffmann 1982). Finally, they both studied physics and philosophy and shared an interest in the methodological implications of relativity theory. Reichenbach was one of five students in Einstein's first seminar on general relativity in 1917. Carnap heard Einstein lecture in about the same period after he had been transferred to the capital for military research (Carus et al. 2019, xi). Later in life, the two would become co-editors of *Erkenntnis*, American citizens, and above all, fellow logical empiricists.

Despite the similarities between their activities as students, Carnap and Reichenbach did not officially meet until a 1923 conference in Erlangen. At the time, Reichenbach was an instructor at the *Technische Hochschule* in Stuttgart and rapidly developing a reputation as "Einstein's bulldog", defending general relativity against a variety of critics (Gimbel & Walz 2006). He was best known for his habilitationsschrift *Relativitätstheorie und Erkenntnis apriori* (1920) which reconciled Einstein's theory with a neo-Kantian epistemology. Reichenbach renounced Kant's "apodictic certainty of all statements about the forms of knowledge" (1922, 29) and replaced the latter's synthetic a priori with a relativized conception in which a priori principles have a constitutive function but change from theory to theory (Friedman 1999; Coffa 1991). Carnap had also just published a dissertation which modified Kant's perspective in the light of Einstein's theory (Carnap 1922, see ch. 32) but he presented a paper more closely related to his later *Aufbau* project at the Erlangen meeting. The conference was a success and

is nowadays viewed as one of the birth grounds of logical empiricism (Limbeck-Lilienau 2022). The participants, also including Kurt Lewin and Paul Hertz, were excited to meet like-minded people and felt that they shared a scientific approach to philosophy (Carnap 1963, 14).

After the conference, Carnap and Reichenbach stayed in a touch to explore the possibilities of creating a journal (Verhaegh 2020a, §2) but publishers were reluctant to issue a periodical exclusively focused on scientific philosophy (Hegselmann and Siegwart 1991). In the end, the two had wait to until 1930 before they could start compiling the first volume of *Erkenntnis*. By then, Carnap and Reichenbach had become leading figures of European scientific philosophy. Carnap's *Der logische Aufbau der Welt* was considered a landmark publication of the Vienna Circle (ch. 35; ch. 36) and Reichenbach had just published his aforementioned *Philosophie der Raum-Zeit-Lehre*. Following a discussion with Moritz Schlick, Reichenbach had moved from a neo-Kantian to a more conventionalist position and introduced the concept of *Zuordnungsdefinition* (coordinative definition) to characterize the relation between formal theories and physical processes (Ryckman 2005; Padovani 2011). In addition, he had established the Society for Empirical Philosophy (later: Society for Scientific Philosophy) as well as an informal discussion circle best known as the Berlin Group (Reichenbach 1936; Milkov and Peckhaus 2013). The society was a forum for communication with the general public—much like the *Verein Ernst Mach* in Vienna. The circle was an irregular discussion group and included Walter Dubislav, Kurt Grelling, Alexander Herzberg and Reichenbach's students Carl Gustav Hempel and Olaf Helmer as members (Gerner 1997).

The Vienna Circle and the Berlin Group were allied institutions but its members did not always see eye to eye. Carnap and Schlick, for example, dismissed Reichenbach's views on probability at the joint conference on the Epistemology of the Exact Sciences in Prague. They objected that Reichenbach's view presupposed a type of realism that was incompatible with the Circle's antimetaphysical stance. In a note ranking metaphysicians "according to their degree of badness", written a few weeks after the conference, Carnap listed Reichenbach as a "modest offender" (Carus 2007, 107). Especially Reichenbach's claim that probabilistic statements cannot be validated or refuted by future experience was incompatible with the view that the meaning of any statement is determined by the contents of experience (Reichenbach 1930b; Zilsel et al. 1930, 268; Schlick 1931). A year later, Carnap, Schlick, and Reichenbach became embroiled in a dispute about the nature of philosophy. Reichenbach had written an opening statement for the first issue of *Erkenntnis* and defined it as journal for the philosophy of scientific knowledge, dismissing traditional philosophy as overly focused on speculation about what is "not yet known" (Reichenbach 1930a, 2-3). Both Carnap and Schlick, who was supposed to be the third editor of the journal, refused to sign Reichenbach's statement and urged him to condemn traditional philosophy in stronger terms (i.e. dismiss it as meaningless). When Reichenbach refused, Schlick resigned and informed his colleague that he had no interest in being editor of a journal that made concessions to traditional philosophy (Milkov 2013; Dewulf 2020; Verhaegh 2020b, §4).

Reichenbach, in turn, was opposed to Carnap's "positivism". He read the *Aufbau* as a phenomenalist work and felt that the system could not do justice to probabilistic statements—omnipresent in science—as they cannot be translated into reports about past observations. Since probabilistic assertations are "invariably predictions of future

experiences", he did not understand how Carnap could account for even the most basic scientific theory without violating the *Aufbau*'s principles (1933, 407). On a more abstract level, Reichenbach believed that Carnap was too focused on system building. In a letter to his former colleague Ernst von Aster, Reichenbach explained that he had always been "consciously focused on solving certain singular problems" because a "comprehensive system would not be possible without solving them first". Carnap's work, on the other hand, exemplified "all the dangers of a too early systematization". Again and again, Reichenbach observed, Carnap "has been forced to withdraw his systems" (June 3, 1935, cited in Verhaegh 2020b, 35).

Reichenbach largely kept his criticism private until he noticed that Anglophone scholars began to view the Vienna Circle as the most prominent movement in European scientific philosophy. In an attempt to improve the reception of the Berlin Group, he published a paper that aimed to correct this narrative. In the article, titled "Logistic Empiricism in Germany and the Present State of its Problems", he emphasized that the Berlin Group, unlike the Vienna Circle, "concentrated on minute work" insisting "that systematic construction must be foresworn until all details have been analyzed" (1936, 150). The paper also repeated his worry that the "tautological character of the positivistic system" cannot do justice to the "practice of science", which is probabilistic in nature (ibid., 152). Two years later, Reichenbach published a textbook—*Experience and Prediction*—that had a similar agenda. In the book, Reichenbach argued that everything we know, including our most basic sense experiences, "can be maintained with probability only". The book outlined Reichenbach's deeply anti-foundationalist, or "probabilistic" empiricism and maintained that there is "no Archimedean point of absolute certainly left to which to attach our knowledge of the world". All we have "is an elastic net of probability connections floating in open space" (1938, 192). Reichenbach also used the book to respond to Carnap's most recent publications, in particular "Testability and Meaning" (Carnap 1936-37), which had introduced the notion of 'degree of confirmation' (ch. 44). Reichenbach submitted that Carnap's new view greatly reduced the "old difference" between their conceptions of empiricism but urged his colleague to analyze "degree of confirmation" in frequentist terms (Reichenbach 1938, 76; Reichenbach 1951, 47-8). Carnap, however, maintained that we ought to keep the two notions apart and later developed it into a strict distinction between logical and frequentist conceptions of probability. The former (probability$_1$) expresses the degree to which a statement is confirmed by a body of evidence and can be established by logical analysis. The latter (probability$_2$) expresses relative frequency in the long run and can only be established empirically (Carnap 1945; Galavotti 2003).

Despite their theoretical differences and occasional feelings of resentment (Damböck 2022, 660; Verhaegh 2021, 59n), Carnap and Reichenbach always treated each other with courtesy and respect. Reichenbach wrote a friendly review of the *Aufbau* (Reichenbach 1933) and invited Carnap to present a paper at the Berlin Society. Conversely, Carnap tried to find a position for Reichenbach in the United States when the latter felt isolated at the University of Istanbul. Carnap had turned down an offer from Princeton because he had just accepted a post at the University of Chicago and tried (but failed) to convince his contacts at Princeton to hire Reichenbach instead (Verhaegh 2020b, §8). Reichenbach returned the favor when he learned that Carnap was unhappy at Chicago and tried to arrange a temporary position for him at UCLA. The two efficiently edited *Erkenntnis* in relative agreement until the journal was (temporarily) discontinued after the German invasion of the Netherlands (Hegselmann and

Siegwart 1991). And when they had both settled in the United States, the two occasionally visited each other in Los Angeles or Santa Fe, where Carnap often resided in the summer (Wienpahl 1978; Reichenbach 1978). Eventually, Carnap was offered Reichenbach's chair when the latter died unexpectedly from a heart attack in 1953.

Still, some of their theoretical disagreements have had small but noticeable wrinkle effects in the development of logical empiricism. Hilary Putnam, who had been Reichenbach's student, became one of the fiercest critics of logical positivism but believed that his teacher's views were wrongfully "lumped together with [those of] the Vienna Circle" (Putnam 1991, 62). Wesley Salmon, a student of Reichenbach from the same cohort, even suggested that those who claim that we "live in a post-positivist age … have no understanding of the difference between the logical positivism of the Vienna Circle and logical empiricism, which originated in Berlin and completely superseded positivism in the second half of the twentieth century" (Salmon 1999, 33). Only with the rise of a new wave of logical empiricism scholarship in the last few decades, some of these tensions have faded. Today, Carnap and Reichenbach are often jointly honored as two of the most eminent representatives of a single philosophical movement (e.g. Spohn 1991; Creath 2022).

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Sander Verhaegh