Chapter 1
Introduction



Jordi Cat and Adam Tamas Tuboly

The Viennese-born polymath Otto Neurath died on 22 December 1945 in Oxford, a few months after the end of World War Two. A social engineer and sociologist of happiness, Neurath was not only a socially sensitive educator, advocating for any institute and organization that was concerned with the well-being of people; he was also a trained scientist and philosopher. Studying mathematics, economics, history, philosophy, and physics in Vienna and then in Berlin during the early years of the long twentieth century, Neurath became involved in many of the disputes among social and natural scientists that shaped the course of the fields.

Through sociological and historical inquiries about how actual science historically developed, Neurath unswervingly propagated in various forums his ideal of the socially relevant "unified science," his fears about the dangers of oversystematization, his misgivings about the concept of neutral "data" and "facts" (also of a neutral "observation language"), and about putting too much weight on theoretical argumentations and logical calculation. There were no exceptions: Neurath debated and poked his friends, fellow logical empiricists and supposed or real enemies with the same vehemence.

His character, style of writing and the priority he gave to social action over intellectual contemplation resulted, however, in a fragile legacy, with no easy classification or safe place in collective memory, whether in the media or in academia, sciences or humanities. This volume – with its essays, translations, and the edited 1940–1945 scientific and personal correspondence of Neurath with Carnap – aims

J. Cat (✉)
Department of History and Philosophy of Science and Medicine, Indiana University Bloomington, Bloomington, IN, USA
e-mail: jcat@indiana.edu

A. T. Tuboly
Institute of Philosophy, Hungarian Academy of Sciences, Budapest, Hungary
e-mail: tuboly.adam@btk.mta.hu

© Springer Nature Switzerland AG 2019

J. Cat, A. T. Tuboly (eds.), *Neurath Reconsidered*,
Boston Studies in the Philosophy and History of Science 336,
https://doi.org/10.1007/978-3-030-02128-3_1

at furthering our understanding of Neurath's life and works in order to see how scientific and philosophical ideas and social projects change over time and across places and what relevance they could still have in our time. The essays collected here also contribute a new range of perspectives and objects of study, from attention to physical objects and collections to attention to logic and its image.

1.1 Preliminary Remarks

How did Neurath's life and writings regain interest, relevance and visibility? And, to whom? In 1947, Philipp Frank, the physicist-turned-philosopher and old friend of Neurath became the director of the *Institute for the Unity of Science* in Cambridge, MA that was after all a continuation of Neurath's earlier Institute in the Netherlands. After Frank died on 21 July 1966 in distressing mental and physical conditions in a nursing home, the American pragmatist Charles Morris approached the Trustees and Committee members to "seriously consider the future of the Institute." Morris also suggested that the Institute, "if this proves necessary, [should aid somehow] the publication of the Neurath volume which Mary [sic] Neurath and Robert Cohen have edited. The book has not yet found a publisher. We might contribute toward the publication or agree to buy and distribute as gifts a number of copies of the book."[1]

Robert S. Cohen was the unrelenting driving force behind Otto Neurath's restoration to a former academic presence in the English-speaking world. He had announced already in 1963 – in the volume *The Philosophy of Rudolf Carnap* (Open Court's Library of Living Philosophers) – that the publication of the *Selected Works of Otto Neurath* was forthcoming (Cohen 1963, 151, n.113). And the volume, prepared by Neurath's widow, Marie Neurath, and Cohen himself, was promptly completed in 1966.[2]

Carnap had been "definitely in favor" of the publication of the Neurath volume, and after a meeting of the Institute in January 1967, Morris reported that "[t]here was unanimous agreement that the Institute should consider a sum of from $500 to $1000 as subsidization of the collection of papers of Otto Neurath […]. The manuscript is now being submitted to publishers. Carl Hempel alone expressed some doubts about the publication of such a volume."[3] As it is well known, the book did

[1] Morris to Professors and Trustees, Institute for the Unity of Science, 25 August 1966 (RC 102-48-18)

[2] Given that most of the papers for the Carnap volume were delivered during the 1950s, the Neurath volume was presumably under construction already in the mid-1950s. See Morris to Carnap, 20 April 1966 (RC 102-48-26).

[3] Morris to Professors and Trustees, Institute for the Unity of Science, 25 January 1967 (RC 102-48-12). On Hempel's case see his letters to Ernest Nagel (2 and 7 September 1966, CH 28–02) and Nagel to Hempel, 3 September 1966 (CH 28–02). Hempel and Nagel were actually against another idea of Morris: to publish a selection of essays (invited and essay-prize style) on the history of the Unity of Science Movement. Both Hempel and Nagel claimed (in the aforementioned letters) that given the interest and commitment to publish the lectures of "John Hopkins Seminars in Philosophy" devoted to logical empiricism it "militates further against the idea of a volume of

not appear until 1973, under the title of *Empiricism and Sociology* as the first volume of the *Vienna Circle Collection*.

The first volume of Neurath's essays was followed by a second (1983); but for a few reviews, the English-speaking academic world did not respond favorably to Neurath's work or the attached memory of his political activities. Two things might be mentioned here. First, even though Neurath had published several monographs and brochures in English, many of them were simply unavailable to the average reader: his books on and using ISOTYPE (1936, 1937, 1939) were not republished for almost three decades. Though the monographs of the *International Encyclopedia of Unified Science* (with Neurath's monograph on the social sciences) appeared as an oversize joint volume in 1971, the reputation of Unified Science was already in ruins.[4] So, even though Neurath's *Einheitswissenschaft* series was published in the *Vienna Circle Collection* under the editorship of Brian McGuinness in 1987, it did not help much towards the recognition and understanding of the movement.

Second, regarding the literature on Neurath, the Anglo-American scholarship was considerably thinner than the German-speaking world's. While there were a few articles by Carl Hempel, Willard Quine, Donald Davidson and others, there wasn't any monograph-length account of his work (see Uebel 1991, 10–14). By contrast, by 1990 a number of books had been published on Carnap's various phases and ideas.[5]

1.2 Phases of the English Neurath Reception

We will focus on the growing English-speaking reception of Neurath's works over the last few decades.[6] We distinguish five periods, each of them documenting a difference in the philosophical interest and the broader context of the Neurath reception.

The first phase opened with the publication of the English translation of Neurath's selected sociological and political essays in the above-mentioned *Empiricism and Sociology*. The volume contained not only 80 pages of important memoirs, but classical papers, pamphlets and mini-monographs such as *Anti-Spengler*, *Personal Life and Class Struggle*, *Empirical Sociology*, the famous manifesto ("The Scientific Conception of the World: The Vienna Circle"), and many more items on pictorial

essays on the Unity of Science." The collection appeared in 1969 as Achinstein and Barker (1969), and without actually mentioning the unity of science.

[4] Not just the whole project decayed slowly, but Neurath's monograph was considered as the "black eye" of the series already when it was published. See Reisch (2003, 208).

[5] See e.g. Kazemier and Vuyjse (1962), Schilpp (1963), Hausman and Wilson (1967), Butrick (1970), Hintikka (1975), Norton (1977), Runggaldier (1984), Proust (1989).

[6] The German-speaking literature also has many interesting items about semantics, protocol-sentences, pictorial education and about the socio-political context of Neurath's philosophical worldview. Nonetheless, since many of these works did not have a major and lasting influence on the secondary English literature, we will not discuss them here.

education, war economy, socialization and planning. This colorful mixture was tied together by the idea that Neurath's scientific and scholarly work had not just a special social and political context, but broader relevance as well. The content of the papers reflected the social embeddedness of his thought in an often elusive tangle of philosophy, science and politics that posed interpretative challenges for the general readers.

A certain A.S.C. (1974, 132) wrote a quite neutral descriptive review of the book, emphasizing that the "anthology displays a many sided character concerned with both conceptual clarity and human happiness." The fact, however, that nothing of philosophical relevance surfaced in the review may have documented an interesting pattern of how scholars read the collection. Others were keener on pointing out the peculiar non-philosophical character of the volume. In another review, Alan Ryan (1976, 194) complained that "the selection of philosophical and sociological work is a bit strange; or, rather, it would be strange, if the audience for whom it is intended were an audience of professional philosophers." The most radical was J. W. N. Watkins on the pages of *The British Journal for the Philosophy of Science*, who complained pointedly about the editors' selection principles: why they included certain items and why they did not include others. Watkins (1974, 343) missed especially the *philosophical* papers of Neurath, ("[f]or the opening volume in a 'Vienna Circle Collection', there is surprisingly little of Neurath's Vienna Circle work"); while on the other hand, he regarded the included items, or at least bigger portions of them, as "Marxist propaganda," "near-banality," or loose and sloppy revelations often prefixed as "to a certain degree," "under certain conditions," indicating some reservations as signs of scientific seriousness but lacking actual explanations.

The most important feature of Watkins's (1974, 345) review was his unwitting "discovery" of a "persistent and striking parallelism, or rather linkage, between Neurath's philosophical ideas and his political ideas." He suggested four main sets of parallels: (1) physicalism and Marxism, (2) physicalism, socialism and economic planning, (3) unified physicalist language and proletarian socialism, (4) international socialism and pictorial education/language. The general parallelism and correspondence, and these particular strands have surfaced many times since in the secondary literature and are treated in detail by the contributors to this volume as well.

But the point was made: when the first portion of Neurath's long awaited collection of essays finally appeared in 1973, the direct reception was more unfavorable than it might have been expected. The above-mentioned complaints document, however, an interesting trend: scholars repudiated Neurath as a serious philosopher due to the lack of formally or rigurously formulated theses and arguments and a politically neutral philosophical look on the world; a few years had still to pass until the English-speaking audience discovered that Neurath's strength might be found exactly in those weaknesses that others did not hesitate to point out repeatedly.[7]

[7] It should be noted as well, though, that Neurath's reception might have been hindered by the lack of conscientious editorial work on his essay-collections. The reviewers of the volume complained that there were no editorial introductions: not a general one for the volume, or shorter ones for the

The second period was distinguished by a well-informed shift towards the *philosophical* relevance of Neurath's ideas, initiated by the publication of his second selected writings, *Otto Neurath: Philosophical Papers 1913–1946*, edited again by Robert S. Cohen and Marie Neurath in 1983. The volume contained essays mainly on theory building, physicalism and the idea of unified science. The detailed elaboration and commentary on these often short, ambiguous, puzzling, almost mysterious revelations would follow in the forthcoming years. The explanatory secondary literature was never meant to provide merely historical contextualizations; it consistently aimed to emphasize the contemporary philosophical relevance of the material. This came also in stages.

The very first monograph on Neurath's work in English was Danilo Zolo's short book, *Reflexive Epistemology: The Philosophical Legacy of Otto Neurath*, written originally in Italian.[8] Zolo (1989, 167) aimed at showing one version of what he called – in Neurathian fashion – "pluri-Neurath": it was a picture of an anti-positivist positivist who could be accepted also by most post-positivists. Utilizing Neurath's famous nautical metaphor, Zolo presented Neurath as a thinker who merited being in the focus of research as much as Schlick or Carnap were, since, like them, he defended important and exciting theses on science, language and method. Though a great deal of the book contributed valuable scholarship, the volume did not receive a good reception overall. Zolo preserved Neurath's ambiguous and somewhat cryptic language thus he did not succeed in replanting Neurath's ideas into the contemporary settings. While almost all the reviews welcomed the *effort* to rehabilitate the unforgotten Neurath, the first line of Richard Creath's (1993, 359) (quite devastating) review summarized the general feeling well: "This is not a very good book, but it has its virtues."

Two years later came a defining breakthrough in the Neurath literature: Thomas Uebel (1991) *translated*, *edited* and *introduced* a volume of papers about Neurath (*Rediscovering the Forgotten Vienna Circle: Austrian Studies on Otto Neurath and the Vienna Circle*), written by leading Austrian scholars in 1991. The papers by Rudolf Haller, Friedrich Stadler, Elisabeth Nemeth, Heiner Rutte, Eckehart Köhler,

---

individual essays; no editorial notes except a few general ones; and there was no systematic statement of purpose on their behalf regarding the selection principles and the general philosophical-historical aim of the edition.

[8] One interesting exception should be mentioned though: in 1966, the logician David L. Székely published a 66 pages long booklet in his monograph series ("Association for Unification and Automation in Science") under the title "Otto Neurath and the Unity of Science Movement." It contained some pages from Charles Morris and a reprint of his 1962 article, "On the History of the International Encyclopedia of Unified Science," along with some papers and remarks of Székely on Neurath and on his own ideas of unification. See Székely and Morris (1966). In 1967, Morris sent out a circular letter to the Institute for the Unity of Science, because Székely wanted to republish it with the help of the Institute to distribute it in America as well (Morris to the Institute, 20 February 1967, RC 102-48-09). In return, Carnap answered that he was happy to have some of Morris's papers in one volume, though Székely's papers were quite weak, thus he did not support the republication of the volume with the help of the Institute (Carnap to Morris, 3 March 1967, RC 102-48-08).

Lola Fleck, Karl Müller, Johann Dvorak, and finally Neurath's son, Paul Neurath, were outstanding scholarly papers about the context, development, and significance of Neurath's life and works.

A year later, Uebel published his own book-length philosophical appreciation of Neurath's significance. The groundbreaking *Overcoming Logical Positivism From Within* (1992) was a major step in the philosophical articulation of Neurath's thought: while the main line of bearing consists of the famous protocol sentence debate, Uebel's effective contribution was far-reaching. Reconstructing the often implicit arguments in sophisticated epistemological terms and filling in the gaps of the various interrelated topics raised new questions, or at least raised them in new terms, about the nature of philosophy, science and their relation. Neurath surfaced as an exciting scholar who had to say something relevant also for our contemporary debates and discussions. *Overcoming* was as historical and philosophical: what Zolo aimed at was achieved by Uebel by relying on the same archival sources but using them as reconstructed items in painstakingly nuanced arguments.[9]

Uebel's reconstruction and the essay collection set in motion a self-propelled machine. First off, several articles appeared about the positions taken by Carnap, Schlick, and especially Neurath in the protocol sentence debate. One approach deserves special attention: it was Thomas Oberdan's (1993) *Protocols, Truth and Convention* that appeared in the same series of *Studien Zur Österreichischen Philosophie* in which Uebel's was published a year before, though there is no reference to Uebel's work in the book. Oberdan (1993, 2) argued that actually much of the "philosophical substance" in and around the protocol sentence debate "derives from the underlying conceptions of language." Though Oberdan's monograph could be read more profitably from the angle of Carnap's development and provides a refined picture of Schlick (it is still underappreciated from *these* angles), *Protocols, Truth and Convention* presented another station towards the contemporary rereading of Neurath and his context.[10]

While both Uebel's and Oberdan's projects started from the protocol sentence debate, they had a bigger aim and a broader perspective as well: namely placing Neurath on the map of twentieth-century intellectual history and putting his ideas back on the philosophical table. These motivations were picked up and developed by various authors in 1996, initiating thus the third phase of the reception. The new phase, however, had a quite peculiar twist in itself: they tried to combine both the socio-political *and* the philosophical angles of Neurath's life and work.

---

[9] Fifteen years later, building on an enormous secondary literature on logical empiricism, Uebel (2007) published an extended, updated and revised version of his book as *Empiricism at Crossroads*. For a longer review essay see Cat (2012).

[10] In his review of Oberdan's book, Thomas Uebel (1995, 312) called the reader's attention to the consideration that "admirers of Neurath are bound to find their man less charitably treated then his ideas deserve." A few years later Uebel (1996, 1999) and Oberdan (1998, 1999) had a debate (one of a few among the logical-empiricism scholars) over anti-foundationalism in the Vienna Circle: though that discussion centered mainly on the interpretation of Schlick, it has also relevance for the contextualization of Neurath as well.

In 1996, two important volumes appeared, approaching somewhat similar and connected themes, thus marking the beginnings of the third period which connected Neurath's political and philosophical ideas through the conception of unified science. *Otto Neurath: Philosophy Between Science and Politics* was written jointly by Nancy Cartwright, Jordi Cat, Lola Fleck, and Thomas Uebel (1996). Besides providing the first detailed English biography of Neurath, and a detailed treatment of the context and philosophical significance of Neurath's various famous ship-metaphors, the authors presented a complex and nuanced version of Neurath's unity of science ideal. They argued that Neurath held a peculiar position regarding the nature and relevance of science: even though he was a pluralist with some relativistic underpinnings, having a broad historical and sociological approach towards the contingency of scientific theories, he still firmly believed in the social and theoretic role of science, and aimed towards the unification and integration of the human and natural sciences accordingly. In the book, they emphasized distinctive features of Neurath's project of unity, method and language and grounded them on a corresponding emphasis on his political context and the inseparable commitments to social goals and the social sciences. In their narrative, this is a quite important and novel account, especially after the science wars and the age of post-modernism of the 1980s and 1990s.

The other book, *Encyclopedia and Utopia: The Life and Work of Otto Neurath (1882–1945)* was a collection of essays, edited by Elisabeth Nemeth and Friedrich Stadler (1996) as the 4th volume of the *Vienna Circle Institute Yearbook* series. It featured 22 essays from Neurath's short biography, through his philosophical ideas to pictorial education and economy. Approaching Neurath's work, which is "linked with each other on several levels" (p. xi.), the collection might be read as providing a more general context and application of the Cartwright-Cat-Fleck-Uebel volume.

During the same period, when Neurath's philosophical papers were published in English, a new tendency appeared in philosophy of science, or at least got a bigger and more seductive voice: numerous scholars argued for the metaphysical and/or methodological disunity of science; this tendency culminated in John Dupré's "The Disunity of Science" (1993) and Peter Galison's and David Stumpf's *The Disunity of Science: Boundaries, Context, and Power* (1996). Against this background, others began investigating what Neurath had meant by such expressions as "unity of science" and "unified science." As it turned out quickly and became evident in the 1996 volumes, it both had a philosophical dimension (but since Neurath would have not used the word "philosophy," it might be more apt to say that "scientific" or "technical" aspect) and a social dimension. The Unity of Science Movement – led by Neurath personally on the continent and through Rudolf Carnap, Charles Morris, and Philipp Frank in the United States – promised a pluralist and permissive alternative to the absolutism and reductionism of other unified and disunified conceptions.[11]

[11] From the early 1990s on, it was George Reisch who published several articles about the Unity of Science Movement, the *International Encyclopedia of Unified Science*, and Neurath's own "planning-account" of unified science. See especially Reisch (1994). Recently John Symons, Olga Pombo, and Juan Manuel Torres (2011) edited a volume on Neurath and the unity of science,

The early and mid-2000s saw another turn in the literature on Neurath. The English bibliography of Neurath's work at the end of his 1983 selected writings promised a volume of Neurath's translated economical works, but it did not appear until 2004 under Thomas Uebel's and Robert S. Cohen's (2004) editorship (*Otto Neurath: Economic Writings. Selections 1904–1945*). The selection featured 19 items from the time of Neurath's doctoral dissertation until his 1946 posthumous writings, relating his most important works on economy, society and social theory. It was supplemented in 2007 by a volume of eight essays discussing *Otto Neurath's Economics in Context* in the Yearbook series, providing some more explanatory remarks on the subject.[12]

The editors (Elisabeth Nemeth, Stefan W. Schmitz and Thomas Uebel (2007)) explained the renewed interest in Neurath's economical thoughts by the fact that Neurath's role in the socialist calculation debate with Ludwig von Mises and F. A. Hayek might have some interesting arguments and refreshing new insights into the current political-economic debates. His notions of moneyless economy and calculation-in-kind proved to be especially important for recent debates and struggles over social and economic discussions. Finally, Neurath's ideal of life-conditions, the pursuit of happiness and ecological economics are also promising fields of research both within the context of logical empiricism and outside.[13]

The fifth and so far final major shift in the reception history came in the late 2000s. It was widely known that Neurath was not a regular philosopher after the linguistic turn, but he was keenly interested in pictures, pictorial education and he established (and also directed) various museums across the globe (among others from Vienna and Berlin through Moscow and The Hague, to Chicago and Mexico). Nonetheless, for a very long time, Neurath's ideas on how one could utilize pictures and museums – in order to disseminate empirical information and emancipate those in need of help – were considered remarkable but cognitively irrelevant anecdotes of his life. Among many analytic philosophers, *education* was perhaps just a practical task beyond first-order theoretical investigation; at least the long neglect of the subject indicates something like that. In these shifts in perspective, new work on Neurath kept tracking broader changes in academic interests.

Such a "neglect" of the pictorial had been justified neither from a bibliographical nor from a philosophical point of view, but it could be explained by the alternative priorities. The surprising aspect is that Neurath's international projection had long been based on his work on visual education. In fact, in the course of his lecture tour of England already in November 1933 (just one year after Schlick's London lectures on "Form and Content" and before Carnap's arrival), Neurath gave various talks on pictorial education and on the importance of his own Viennese method at Bristol's

though Thomas Uebel (2013) suggested that most of the volume should be treated with a grain of salt. On the relations between science and politics of Neurath see Cartwright, Cat, and Chang (1991) and (1996).

[12] Though it should be mentioned that Thomas Uebel's more than one hundred pages long editorial introduction to the selection of Neurath's economical writings is still a landmark in the field.

[13] On Neurath and the theoretical and practical idea of happiness see Whyte (2007), Stuchlik (2011) and Sandner (2019).

Education Department of the Bristol Co-operative Society; at Fircroft College, Birmingham University and presumably other places as well, including London.[14] Later in 1937, the Dundee-based *The Courier and Advertiser* newspaper published a short summary of Neurath's method, now under the name "ISOTYPE" as "You Draw This New Language." Besides having a few pictures and a regular description of Neurath's approach, the article ends with the followings: "Give it to a man in a ship's fo'c'sle or an Einstein in his study and in a few minutes it will teach more than millions of words in an ordinary encyclopedia."[15]

Neurath's first visits to England were connected to the interest in his ideal of pictorial education and its practical context, and not in the theoretical philosophy and ideal of analysis of logical empiricism. Then, in the 2000s, the academic presence and influence of mass and visual media became even more widespread, interest in Neurath's visual education got more and more intense. Neurath had named his new method of representing mainly statistical data as *Vienna Method of Pictorial Statistics* (*Wiener Methode der Bildstatistik*) after its geographical origins. Later, in the 1930s, when the whole business became internationally famous, he renamed his brainchild after his later third wife's suggestion (Marie Reidemeister/Neurath) as ISOTYPE, that is, *International System of TYpographic Picture Education*. Representing statistical data visually became so easy and comprehensible, that Neurath believed that his ISOTYPE method could be applied also in the post-war reconstruction era since it does not require any specific linguistic capacities so it could reach a wider and broader fragment of society.

Fortunately, a number of illuminating volumes and monographs have appeared on Neurath's ideal of how pictures, statistical data and museums could be related and integrated in order to yield the most available and standardized method for the dissemination of knowledge to emancipate the masses for the future. The specific method of creating ISOTYPE charts and transforming pure statistical data into pictures was called "transformation" and Robin Kinross published a book on the process (Kinross and Neurath 2009) that contains materials also from Marie Neurath and thus makes it an essential first-person reconstruction of the world of ISOTYPE. Another such recollection is Neurath's (2010) long waited visual autobiography that was published recently under the editorship of Christopher Burke and Matthew Eve. Certain extracts (Neurath 1946) were published already after Neurath's death: they were edited by Marie Neurath and the famous British filmmaker Paul Rotha who also collaborated with the Neuraths during World War Two.[16] An important and unique collection of essays on the history of ISOTYPE (from the 1920s to the 1970s when Marie Neurath retired from the Isotype Institute in

[14] Neurath's lectures were advertised every day before the lectures at the local newspapers: *Western Daily Press* and the *Bristol Mirror* (2, 3, 6 November 1933). Neurath's Birmingham lecture was interconnected with the 1933 Workers Educational Association's National Conference.

[15] In 1933 (17 November, *Daily Herald*), as it was claimed in a journal article, Neurath called his method as "The Mickey Mouse of Social Facts."

[16] On the significance of Rotha's films in Britain and his relation to Neurath, see recently Boon (2016).

England) appeared recently by Christopher Burke, Eric Kindel, and Sue Walker (2013).

Finally there are two monographs that especially aimed at the reconstruction and discussion of Neurath's ideas of how knowledge-dissemination, democracy, pictures and education are related: Hadwig Kraeutler (2008) published a book (actually the only one on the subject) on Neurath's museum work and his contemporary museological relevance; the other (highly pictorial) treatise was published by Nader Vossoughian (2008) depicting Neurath's ideal of the global polis. Both volumes depicted a range of Neurath's interests long regarded as interesting side-events in his life without major theoretical or practical importance, worth careful and detail studies. Things keep changing.

1.3 Chapters of the Volume

In his editorial introduction to *Rediscovering the Forgotten Vienna Circle,* Thomas Uebel (1991, 4) pointed out that "[t]he case of Neurath […] presents both a puzzle and a promise." We think that Neurath's "case" (that is, his role in logical empiricism, in the unified science movement, in ISOTYPE, and still-neglected remarks) still shows promise: presumably now more than ever. In the age of heavily questioning not just science or scientific procedure, but even the bare fact of "facts" and "truth," one might raise the question with increasing scruples: how could science have any social and theoretical relevance? As it was emphasized by Nancy Cartwright, Jordi Cat, Lola Fleck and Thomas Uebel (1996, 3), even if some remarks of Neurath are "familiar in contemporary post-modern discourse […] Neurath had one striking difference from most post-moderns. Although he was a pluralist regarding knowledge-systems and took seriously their historical and cultural roots, he trusted firmly in the power of science."

Therefore the volume serves two aims. Firstly, by pointing out new perspectives on Neurath's life and work, the various chapters will demonstrate how one can think and act in a society as a scholar without believing in "the science" or "the system of science," or in "facts" and "truth." The argument is also historical insofar as it features an actual, thus possible, model, embedded in evolving sets of particular circumstances. Secondly, the essays collected here also point to where the fruitful *puzzles* in the life and work of Neurath were and still are, and, in passing, what makes them so.

Part I of the volume includes four essays and aims at a general introduction to Neurath's life and work, emphasizing those elements that shed light on Neurath's oeuvre from both familiar and new perspectives. In Chap. 2, the volume opens with Friedrich Stadler's introduction to Neurath's life of intellectual, literary and other sorts of risks, dangers and adventures. Stadler calls attention to Neurath's libraries and collections. Already in his childhood, Neurath was fascinated by his father's enormous library, where he was especially drawn to visual illustrations some dating back to Ancient times and the French *Encyclopédie*, and inspiring lifelong dealings

with pictorial communication. Cases in point are the founding of his Social and Economic Museum of Vienna and the invention of the so-called Vienna Method of Pictorial Language, later on renamed ISOTYPE. During the flourishing "Red Vienna" period he added to his father's library numerous books in several languages that he used as aids in his intense new life as a social reformer, teacher and museologist, philosopher, sociologist and historian of science. With his forced migrations from Vienna and The Hague, this most valuable collection of books and brochures was partly destroyed, dispersed, and also *aryanized* when Austro-Fascism came into power in Austria and Hitler's troops invaded into the Netherlands. Fortunately, Neurath himself and a few family members and collaborators survived and barely managed to save parts of this unique collection of books that offers a different glimpse into the education and intellectual background of the polymath Neurath in Dutch and British exile. Also while in exile he bought and published books, amassing some 3000 volumes, all in the process of continuing his activities for the causes of Logical Empiricism, the Unity of Science and Isotype. Stadler presents three typical case studies from the Neurath library provided spanning his interests economics, philosophy and literature: Neurath's annotations in books of Friedrich A. von Hayek, Karl Popper, and the writer Stefan Zweig.

Don Howard considers in Chap. 3 the question of philosophy's relevance to extra-academic concerns that is still much with us today. Plato told us that once the philosopher has seen the truth in the full light of the sun, she must return to the cave, there to put knowledge to work in making a better world, even though, being temporarily unaccustomed to the dark, she risks ridicule from those still in thrall to illusion. Howard reflects upon the life and career of Neurath as a modern exemplification of this ideal of philosophical engagement. In spite of, or, perhaps, because of having never held an academic appointment beyond his early post at the New Vienna Trade School, Neurath made a considerable difference to the education and living conditions of many. The key components of what Howard terms Neurath's "philosophy of science in action" are explicated in order to understand how that could be. Foregrounded are Neurath's socialism, his own version of the thesis of the empirical underdetermination of theory by evidence, his anti-metaphysical stance, and his commitment to physicalism and the unity of science. The paper concludes with a discussion of the contemporary relevance of Neurath's model of engaged philosophy of science.

In Neurath's work, there was always a close relationship between science and politics; it is worth noting, however, that he also intervened in the politics of the day. In Chap. 4 Günther Sandner focuses on Neurath's time in Revolutionary Bavaria and Red Vienna and analyzes his articles in two newspapers in the interwar period: the German periodical *Economy and Order of Life* (a supplement of the *Art Guardian*) and the Austrian socialist daily *Worker's Newspaper*. The examination starts when Neurath became a socialist and member of the Social Democratic Party (SPD) after the war in Germany and ends shortly before his forced migration from Austria in 1934. The two series of articles differed in several respects. While in *Economy and Order of Life* Neurath focused only on socialization, he addressed a number of different topics in the *Worker's Newspaper*. The question of his role and

self-image was a common theme in many of these articles. Beyond that, however, there were intimations to closely related themes that he developed more precisely only later in his life: the question of experts, citizens, and democracy. All of these provide new perspectives on Neurath's life and works.

Finally, the general aim in Chap. 5 of Adam Tamas Tuboly's essay is to give a biographical, historical, and philosophical reconstruction of Neurath's final years in England. Besides reconstructing Neurath's arrival in England, he argues that since the 1930s, Neurath was eager to promote further the brand and fortunes of logical empiricism. His conception of the brand was based not on attention to theoretical commitments, but on practical considerations and decisions. Using a detailed case study of Neurath's relation to the Hungarian sociologist of knowledge Karl Mannheim, Tuboly shows that the development of their connections documents how Neurath gave increasing priority to practical aims. The concluding section points to some further considerations on Neurath's legacy.

Part II contains essays that are bound together by the idea that Neurath's method and ideal of science are unthinkable without the social context and its social goals. In a paper, updated and extensively revised for this volume, in Chap. 6, Elisabeth Nemeth shows how two domains of Neurath's broad and multifaceted work are intimately related: the concepts and methods he wanted to implement in political economics, on the one hand, and the methods of visualization that he and his interdisciplinary team developed at the Social and Economic Museum of Vienna, on the other. Some of Neurath's suggestions in both domains, as Nemeth argues in detail, seem surprisingly modern even today.

Neurath made unique contributions to the fields of museology and curation, which culminated in the founding of Social and Economic Museum of Vienna and its mobile exhibitions in the 1920s. But until today, Neurath's involvement in the organization of portable "field exhibitions" that predated those at the Social and Economic Museum by at least half a decade remains understudied. In Chap. 7, Sophie Hochhäusl argues that field exhibitions, which were informed by Neurath's theories on war economy, are instructive in analyzing his overall curatorial ideas. Staged on the outskirts of the city in collaboration with allotment garden and settlement cooperatives, these exhibitions utilized plans, diagrams, and pictorial statistics to convey social and political statements of facts but also everyday objects. By pairing abstract graphic information with everyday objects, they invited inhabitants into a conversation about the material world as well the future drawing on personal experience. As such, field exhibitions created a communal environment for viewing and debating information and championed what she calls "a collaborative practice of seeing."

Angélique Groß considers Neurath's famous ISOTYPE and practical concerns related to pictures in Chap. 8. In relation to education, she argues, Neurath did not articulate a philosophy or a theory; he just practiced education and arranged it for employees institutionally, personally, didactically and methodically. In a similar way, his methodical procedure of transformation, which is manifested in the pictorial presentation system of ISOTYPE, was not based on an explicit theory of depiction. Instead, according to Groß, Neurath developed a concept whose realization

evolved through a successful practice of transmission. However, in the practice of educational depiction, Neurath resorted to constants that are describable analytically as theoretical implications. In this respect, Groß's contribution points out the context of the educational and descriptive practice and its evolution out of Neurath's ideals and concrete standards.

In Chap. 9, Thomas Uebel draws attention to elements of Neurath's economic works that make them relevant even to contemporary discussions. Uebel confronts Neurath's controversial contributions to the socialist calculation debate with the criticism of two well-known opponents, Ludwig von Mises and Max Weber. Uebel examines each side's arguments at a certain level of abstraction so as to allow what are lasting points of significance in Neurath's proposals to shine through more clearly. While these points are closely interwoven with Neurath's schemes for marketless socialism, they are conceptually independent. Suitably so, they have proven influential in just this independent capacity.

Neurath's early work on the classification of systems of hypotheses in optics provided some of the key insights of Neurath's later philosophy of science. In Chap. 10, Gábor Á. Zemplén investigates how Neurath developed his theory of theory-classification in response to inconsistencies he stumbled upon while studying the historical theories. Neurath's empiricism and thoroughgoing fallibilism, according to Zemplén, informed his mapping of the group of theories, locating "elementary notions" of theories and taking into account the "blurred margins" of theories. To replace false dichotomies the project provided a finer-grained analysis of theories and could be utilized to locate unconceived alternatives. Zemplén discusses the close links between Neurath's optical essays, his notion of an "auxiliary motive," and his attack on pseudorationalism in the "Lost Wanderers of Descartes" paper. He also provides a comparison of the two essays, with an extended table of the elementary notions Neurath listed, and discusses Neurath's two-tier methodology for historical reconstruction.

In the three essays of Part III, hitherto almost unknown or unfortunately neglected aspects and fields of Neurath's works are taken up from new perspectives. In Chap. 11, Jordi Cat introduces a broader intellectual context and sketches an integrated account with the purpose of examining the significance of Neurath's attention to logic in early works and subsequent positions. In the process he draws attention to the significance of work by Olga Hahn and Susan Stebbing. The specific attention to algebraic logic is important in integrating Neurath's own interest in mathematics and combining, since Leibniz, the ideals of a universal language and of a calculus of reasoning. The interest in universal languages constitutes a much broader, so-called tradition of pasigraphy that extended beyond philosophical projects. Cat argues (1) that Neurath's works can be embedded in a richer intellectual landscape that includes developments in logic and their local reception in Vienna, and that his attention to logic developed a sustained symbolic standpoint – with semiotic and typographic expressions; (2) that specific aspects of the work in algebraic logic became a standard and a resource in subsequent work often thought independent, while its value was steadily challenged by the separate goal of empirical theorizing and practical application in social domains – including in the areas of economics,

history and visual communication; (3) that, in particular, the presentation of systems of algebraic logic by Neurath's sources such as Stanley Jevons and Schröder was not isolated from discussions of political economy; and finally (4) that some of Neurath's positions in matters of language, unity and epistemology in the articulation of logical empiricism and its debates are better understood in terms of shared but diversified acquaintance with pasigraphy, formal standards and logical projects.

Carnap is still often portrayed as a "representationalist." While the genealogy of this prejudice may not actually go back to Neurath's response to Carnap's embrace of Tarskian semantics, there is a continuity of motivation and rhetoric. However, based on a reading of the later Neurath-Carnap correspondence reproduced in this volume, A. W. Carus argues in Chap. 12 that the apparent dispute between them over semantics really was largely terminological, with certain differences of emphasis amplified by personality differences and the long interruption of personal contact due to the war. Carus claims that their conceptions of a language of science can be reconciled. Carnap was neither a representationalist nor an anti-representationalist nor an inferentialist (though it may appear that he can legitimately be portrayed as any of these), since ultimately to embrace one of these positions is to endorse an "order of explanation" or ontological primacy, and, argues Carus, Carnap rejected ontology.

In Chap. 13 Derek Anderson argues for the centrality of syntacticism to Neurath's physicalism, encyclopedism, and the unity of science program. He defends the intelligibility of Neurath's opposition to semantics and underlines the role syntacticism plays in his anti-metaphysical empiricism. As Anderson argues, Neurath was correct to fear that the semantic turn would spell the end of logical empiricism. Many of the most influential metaphysical arguments of the twentieth century turn on premises that would be undermined by a Neurathian rejection of semantics.

The last part of essays are devoted to the context and influence of Neurath's ideas, emphasizing again topics and issues that were either rarely discussed in the secondary literature so far or, if they are well-known, they are represented under new lights also with regards Neurath's legacy.

In Chap. 14, George Reisch examines selected writings of the American science writer Waldemar Kaempffert, Science Editor for the *New York Times*, in public support of Otto Neurath, his Isotype projects, and his Unity of Science Movement. His attention focuses first on Kaempffert's writings in the 1930s, when some intellectuals, the American public, and their elected leaders were relatively sympathetic with Neurath's quest to unify the sciences in ways that would advance and direct scientific research toward practical goals. Then he turns to the 1940s to examine the debate over the nature, scope, and limits of wartime research and Vannevar Bush's call for a national institution to support research. Against Bush, James Bryant Conant, and others, Kaempffert argued vigorously for a foundation that would adopt values and methods of the Unity of Science Movement, but he lost that argument as the National Science Foundation finally took shape. To suggest that this public debate influenced not only the decline of Neurath's Unity of Science Movement but the scholarly development of history and philosophy of science after the war, the paper considers early writings and events in the life of Conant's protégé

Thomas Kuhn, whose *Structure of Scientific Revolutions* helped shape that development.

Neurath's version of functionalism is one that begins with people "as we find them," a proposition first set out in his 1917 essay "The Converse Taylor System." Any attempt to redesign the existing furnishings of everyday life must take into account "functions" that go beyond the obvious purpose of objects: functions that are to do with sociability, happiness, familiarity, the love of "coziness," and that address the diversity and contradictoriness of people. In Chap. 15, Michelle Henning considers how Neurath applied and made use of these ideas about design in 1940s Britain, during and after his internment on the Isle of Man between 1940 and 1941 and in talks, papers and correspondence from this period. Henning does not focus on the Isotype Institute, which would usually be considered his principal intervention in design, but on his commentary on everyday objects and practices. In particular, Henning focus on four objects (if they can be called that) – tennis courts, fireplaces, chairs and shoes – and through these elaborate some of the connections between Neurath's ideas about the design of everyday life, and the significance of everyday practices, and his logical empiricism.

In Chap. 16, Antonia Soulez considers Otto Neurath's late discussion of the political and social context of Plato's *Republic*, especially how Neurath conceived them in the 1940s. Neurath's argumentation is contrasted with the ideas of Karl Popper, both with regard to the latter's reading of Plato and to his general methodology. The distinction between Neurath's treatments of epistemology and politics is also discussed, by highlighting how these two were interwoven in the discussion, and how they differentiated Neurath's articles from Popper's considerations in the *Open Society*.

Silke Körber (Chap. 17) picks up a rarely discussed episode in Neurath's life, namely his relation to L. Susan Stebbing and their joint efforts to educate the "common reader." Stebbing supported Neurath's pragmatic ideas on the "humanization" of knowledge, and both of them were looking for ways to apply modern logic and linguistic analysis, not only to the transfer of information in science and teaching but above all in publication projects for the "common reader." In 1941, Stebbing became the first president of the Isotype Institute in Oxford, which Neurath directed until 1945. Soon after ISOTYPE was founded, long-term relations began between it and the book-packaging company Adprint, managed by German-speaking emigrés in London, as well as its successors and British clients (publishers). A technically and organizationally sophisticated process for the production of illustrated non-fiction books was gradually established. Körber argues that the "picture-text style" developed by Neurath and epitomized in *Modern Man in the Making* (1939) was applied to non-fiction books and series with "integrated layouts," then professionalized and successively transformed into a production model for illustrated books which enabled scientific information to be prepared for the mass market and the "common reader" – in the service of a modern, democratic (post-war) society.

Logical positivists had a very lively interest in the revolutionary science of their time, but also in modern art and especially in 'international style' architecture. Surprisingly they never published a representative volume or longer statement on

art and architecture. In Chap. 18, Hans-Joachim Dahms points out that it is not well known that Otto Neurath, the leading organizer and spokesman of logical positivsm, invited the (later on) eminent art historian and critic Meyer Shapiro (professor at Columbia University NY) to contribute a volume on art to the *International Encyclopedia of Unified Science*. Shapiro failed to deliver the promised book. But from the extended correspondence and some material in the Shapiro papers, Dahms describes the general direction the project might have taken. The correspondence deserves attention also because it also covers questions of the endangered peace and the approaching war, the academic scene in Europe and in the USA, and surprisingly: Martin Heidegger. Neurath died in 1945, but, as Dahms points out, Shapiro came back to the Heidegger theme in 1968 when he wrote his famous harsh criticism of Heidegger's programmatic long paper "Das Kunstwerk" (the work of art) where he interprets one of Van Gogh's shoe-paintings.

The volume ends with two appendices. Appendix 1 contains the English translation of Neurath's logic papers: there are three papers with Neurath as the sole author, one co-authored with his wife-to-be Olga Hahn – the sister of his logical empiricists colleague and mathematician Hans Hahn –, and one whose sole author was Olga Hahn. The translations are completed with Jordi Cat's editorial comments that aim to clarify and contextualize these important papers, which appear here in English for the very first time.

Appendix 2 contains the 1940–1945 Neurath-Carnap English correspondence. Though there are many (side) issues recurring throughout the letters, seven themes stand out as the core issues of Neurath and Carnap's late correspondence.[17] These are, in (sometimes overlapping) temporal order, the following: (a) *emigration* (b) *the relation between Platonism in the history of philosophy and the oppressive German climate that lead to Nazism*, (c) *semantics*, (d) *Popper's philosophy*, (e) *Russell's philosophy*, (f) *Neurath's* Encyclopedia *monograph*, and (g) *Neurath's own place in the movement*.

After Neurath fled The Hague towards England in May 1940 he was interned on the Isle of Man as a so-called enemy alien. This "prison-experience" became fixed in Neurath's experience of emigration more broadly, shaping the way he, for instance, evaluated comparatively British and Continental standards and experiences of social life. Some of these events are reconstructed and discussed by Michele Henning (Chap. 15.) and Adam Tamas Tuboly (Chap. 5.). Also the fact that the letters that make up the correspondence were written in English constitutes a telling expression of Neurath and Carnap's new life in exile.

One of the last major preoccupations Neurath addressed in print and in private was the relation of Platonism and Kantianism to the so-called German climate, stemming from his reading and personal experiences before and during World War Two. Even though he published some papers under a pseudonym and under his own name with J. A. Lauwerys, his correspondence constitutes an even more valuable source of insight: it functioned as a reading diary as well, and Neurath commented

[17] The 1923–1940 Neurath-Carnap correspondence is being now transcribed and edited for publication by Johannes Friedl, Ulf Höfer, Christian Damböck, and Adam Tamas Tuboly.

on many important events of his life. He described at various places in his letters how the irrational inclination towards the idealism and perfectionism extolled by Platonism and the relentless pressure from duties and imperatives of the Kantian doctrines contributed to a very special cultural climate that played an important role nourishing the broad adoption of oppressive ideologies in the 1930s. These questions are discussed in Antonia Soulez's paper (Chap. 16.).

The absolutist elements in the history of philosophy are highlighted not just in the classical works of the field, but in Neurath's contemporaries as well. He is unsparing towards Carnap's new field of semantic investigations: while he addressed more technical epistemological and logical arguments against semantics from a pragmatist ground, Neurath's main concern was more political. He was afraid that talking about "the truth" and "the meaning" of statements might easily lead to absolutist conceptions in philosophy, and these conceptions could become new tendencies that might be used (at the end of the slippery slope) for intolerant social and political views. Neurath's arguments against semantics are discussed by André Carus (Chap. 12.) and Derek Anderson (Chap. 13.), while Jordi Cat (Chap. 11.) also considers the background of Neurath's logical works that led finally to his mature views on formalism, truth, systematization, and semantics.[18]

Besides Carnap, Karl Popper and Bertrand Russell weren't treated with any patience or sympathy either. Popper was the methodological boogeyman for Neurath since the early 1930s when the former came up with the idea of the *Logik der Forschung* book and Neurath reviewed it critically. He detected many pseudo-scientific and absolutist elements in Popper's ideal of falsification, deductive-schemes and ambition towards systematization and lawfulness.[19] On the other hand, though Russell was considered to be the grandfather of logical empiricism, in the 1940s, he was viewed with much more skepticism: as he embraced the notions of "truth," "meaning," "semantics," and "facts," Neurath distanced himself even more from him. Though in his published articles we find only a few remarks and hints (Neurath 1941/1983), his correspondence with Carnap was centered often on the discussion of Russell's new *An Inquiry into Meaning and Truth*. The movement was facing a crisis that pitted disagreement and change against the desire for a stable, visible and inspiring identity, or brand.

The *International Encyclopedia of Unified Science* was a grandiose enterprise that started in 1938 under the general editorship of Neurath, and as inevitably happens, its scope, standards and reception kept changing over time. Neurath's own 1944 monograph was perceived to be knotty by many: Carnap withdrew his name from the cover, indicating that he has nothing to do with this special volume. While the reason was that Carnap saw the page-proofs at too late a point and had too many objections to the contents, Neurath feared that darker motives hid behind Carnap's attack and the ensuing (yet another) confrontation would not help either Neurath's

[18] The political dimension of Neurath's debate with respect to semantical analysis is taken up by George Reisch (2005, Chap. 15.) in his earlier book.

[19] Neurath's relation to Popper is discussed in details by Cartwright, Cat, Fleck, Uebel (1996, Part 3) and Cat (1995).

leadership, friendship or the intellectual movement. The correspondence documents many such latter-day tensions between Carnap and Neurath. Their debates were not just personal, that is, not just a difference in attitudes is manifest in these letters: there were much more at stake, namely different conceptions of philosophy in general, not unrelated to the difference in attitudes and politics, and the very future and fate of logical empiricism.

With regard to the nature and dissemination of the movement, Neurath also tried to clarify his own leadership role. The orthodox picture of Neurath presents him as a "dynamo": who utilized half-baked arguments and showed much more agility in organizing, and thus become the "big locomotive" of logical empiricism, as once Carnap called him. The Neurath-Carnap correspondence, however, points to different motives: Neurath considered himself as a theoretician as well, having in store important ideas on science and its methodology. In recent scholarship thus Neurath emerged as an original thinker, often ahead of his time: our difficulties in understanding him stems from the fact that much of Neurath's writings were polemical, and thus needs much contextualization. These questions are taken up by Don Howard (Chap. 3.), Günther Sandner (Chap. 4.) and Adam Tamas Tuboly (Chap. 5.), who argue for a middle-way picture that finds places the sought-after theoretical significance in Neurath's practical efforts.

Otto Neurath is one of those few figures from the twentieth century who achieved various theoretical results and defended important intellectual and social positions that have been later taken up by others in numerous fields. Starting with history, economics, sociology, education, theory of pictures, housing and museums, along with logic, semantics, and general classifications of theories, Neurath could be seen as a special non-philosophical scholar. However, as the following chapters will make clear, there was always something deeply philosophical in how Neurath tried to extend his points of views outside the classical territory of philosophy. Still, even when assessing just Neurath's intellectual significance, the philosophical investigation shouldn't become the sole task and measure.

Acknowledgements During the preparation and edition of this volume, Adam Tamas Tuboly was supported by the *MTA BTK Lendület Morals and Science* Research Group; by the MTA Premium Postdoctoral, the *János Bolyai Research Scholarship* and by the "Empiricism and atomism in the twentieth-century Anglo-Saxon philosophy" NKFI project (124970). We are indebted to the Carnap Archive (Rudolf Carnap Papers, 1905–1970, ASP.1974.01, Special Collections Department, University of Pittsburgh) and to the Hempel Archive (Carl Gustav Hempel Papers, 1903–1997, ASP.1999.01, Special Collections Department, University of Pittsburgh) for the permission to quote their materials. All rights reserved.

References

A.S.C. 1974. Review of Neurath's Empiricism and Sociology. *The Review of Metaphysics* 28 (1): 131–132.

Achinstein, Peter, and Stephen F. Barker, eds. 1969. *The Legacy of Logical Positivism*. Baltimore: The John Hopkins Press.

Boon, Timothy. 2016. 'To formulate a plan for better living': Visual communication and scientific planning in Paul Rotha's documentary films. In *Pursuing the Unity of Science: Ideology and Scientific Practice from the Great War to the Cold War*, ed. Harmke Kamminga and Geert Somsen, 156–181. London: Routledge.

Burke, Christopher, Eric Kindel, and Sue Walker, eds. 2013. *Isotype: Design and Contexts, 1925–1971*. London: Hyphen Press.

Butrick, Richard. 1970. *Carnap on Meaning and Analyticity*. The Hague: Mouton.

Cartwright, Nancy, Jordi Cat, and Hasok Chang. 1991. Otto Neurath: Unification as the Way to Socialism. In *Einheit der Wissenschaften*, ed. J. Mittelstrass, 91–110. Berlin: de Gruyter.

———. 1996. Otto Neurath: Politics and the Unity of Science. In Galison and Stump (1996): 347–369.

Cartwright, Nancy, Jordi Cat, Lola Fleck, and Thomas Uebel. 1996. *Otto Neurath: Philosophy Between Science and Politics*. Cambridge: Cambridge University Press.

Cat, Jordi. 1995. The Popper-Neurath Debate and Neurath's Attack on Scientific Method. *Studies in History and Philosophy of Science Part A* 26 (2): 219–250.

———. 2012. Review of Uebel's Empiricism at the Crossroads. *HOPOS* 2 (2): 354–360.

Cohen, Robert S. 1963. Dialectical Materialism and Carnap's Logical Empiricism. In *The Philosophy of Rudolf Carnap*, ed. Paul A. Schilpp, 99–158. La Salle: Open Court.

Creath, Richard. 1993. Review of Zolo's Reflexive Epistemology. *Philosophy of Science* 60 (2): 359–360.

Dupré, John. 1993. The Disunity of Science. *Mind* 92: 321–346.

Galison, Peter, and David Stump, eds. 1996. *The Disunity of Science. Boundaries, Contexts and Power*. Stanford: Stanford University Press.

Hausman, Alan, and Fred Wilson. 1967. *Carnap and Goodman - Two Formalists*. Iowa: University of Iowa.

Hintikka, Jaakko, ed. 1975. *Rudolf Carnap, Logical Empiricist: Materials and Perspectives*. Dordrecht: D. Reidel.

Kazemier, B.H., and D. Vuyjse, eds. 1962. *Logic and Language: Studies Dedicated to Professor Rudolf Carnap on the Occasion of His Seventieth Birthday*. Dordrecht: D. Reidel.

Kinross, Robin, and Marie Neurath. 2009. *The Transformer: Principles of Making Isotype Charts*. London: Hyphen Press.

Kraeutler, Hadwig. 2008. *Otto Neurath. Museum and Exhibition Work: Spaces (Designed) for Communication*. Frankfurt am Main: Peter. Lang.

Nemeth, Elisabeth, and Friedrich Stadler, eds. 1996. *Encyclopedia and Utopia: The Life and Work of Otto Neurath (1882-1945)*. Dordrecht: Kluwer.

Nemeth, Elisabeth, Stefan W. Schmitz, and Thomas Uebel, eds. 2007. *Otto Neurath's Economics in Context*. Dordrecht: Springer.

Neurath, Otto. 1936. *International picture language. The first rules of Isotype*. London: Kegan Paul, Trench, Trubner.

———. 1937. *Basic by Isotype*. London: Kegan Paul, Trench, Trubner & Co..

———. 1939. *Modern Man in the Making*. New York: Alfred A. Knopf.

———. 1941/1983. Universal Jargon and Terminology. In *Empiricism and Sociology*, ed. Robert S. Cohen and Marie Neurath, 213–229. Dordrecht: D. Reidel.

———. 1946. From Hieroglyphics to Isotype: Extracts from the Manuscript (edited by Marie Neurath and Paul Rotha). *Future Books* (3): 92–100.

———. 2010. *From Hieroglyphics to Isotype: A Visual Autobiography*, ed. Christopher Burke and Matthew Eve. London: Hyphen Press.

Norton, Bryan G. 1977. *Linguistic Frameworks and Ontology. A Re-Examination of Carnap's Metaphilosophy*. The Hague: Mouton.

Oberdan, Thomas. 1993. *Protocols, Truth and Convention*. Amsterdam: Rodopi.

———. 1998. Discussion: The Vienna Circle's 'Anti-Foundationalism'. *British Journal for the Philosophy of Science* 49: 297–308.

———. 1999. Deconstructing Protocols: Reply to Uebel. *British Journal for the Philosophy of Science* 50 (2): 301–304.

Proust, Joëlle. 1989. *Questions of Form: Logic and Analytic Proposition from Kant to Carnap*. Minneapolis: University of Minnesota Press.

Reisch, George. 1994. Planning Science: Otto Neurath and the International Encyclopedia of Unified Science. *British Journal for the History of Science* 27: 153–175.

———. 2003. Disunity in the International Encyclopedia of Unified Science. In *Logical Empiricism in North America*, ed. Gary L. Hardcastle and Alan W. Richardson, 197–215. Minneapolis: University of Minnesota Press.

———. 2005. *How the Cold War Transformed Philosophy of Science. To the Icy Slopes of Logic*. New York: Cambridge University Press.

Runggaldier, Edmund. 1984. *Carnap's Early Conventionalism: an Inquiry into the historical background of the Vienna Circle*. Amsterdam: Rodopi.

Ryan, Alan. 1976. Positivism and Sociology [review]. *The Philosophical Quarterly* 26 (103): 194–195.

Sandner, Günther. 2019. Bringing Happiness. Otto Neurath and the Debates on War Economy, Socialization and Social Economy. In *Philosophy of Social Science*, ed. Friedrich Stadler, Sami Philström, and Niels Weidtmann. Cham: Springer. Forthcoming.

Schilpp, Paul, ed. 1963. *The Philosophy of Rudolf Carnap*. La Salle: Open Court.

Stuchlik, Joshua. 2011. Felicitology: Neurath's Naturalization of Ethics. *HOPOS* 1 (2): 183–208.

Symons, John, Olga Pombo, and Juan Manuel Torres, eds. 2011. *Otto Neurath and the Unity of Science*. Dordrecht: Springer.

Székely, D.L., and Charles Morris. 1966. *Otto Neurath and the Unity of Science Movement*. Jerusalem: Mimeographed monograph of the Association for Unification and Automation in Science.

Uebel, Thomas, ed. 1991. *Rediscovering the Forgotten Vienna Circle: Austrian Studies on Otto Neurath and the Vienna Circle*. Dordrecht: Kluwer.

———. 1992. *Overcoming Logical Positivism from Within – The Emergence of Neurath's Naturalism in the Vienna Circle's Protocol Sentence Debate*. Amsterdam: Rodopi.

———. 1995. Review of Oberdan's *Protocols, Truth and Convention*. In *The Foundational Debate: Complexity and Constructivity in Mathematics and Physics*, ed. W. Depauli-Schimanovicz, Eckehart Köhler, and Friedrich Stadler, 310–312. Dordrecht: Kluwer.

———. 1996. Anti-Foundationalism and the Vienna Circle's Revolution in Philosophy. *British Journal for the Philosophy of Science* 47: 415–440.

———. 1999. Protocols, Affirmations, and Foundations: Reply to Oberdan. *British Journal for the Philosophy of Science* 50: 297–300.

———. 2007. *Empiricism at the Crossroads. The Vienna Circle's Protocol-Sentence Debate*. Chicago: Open Court.

———. 2013. Two Halves of Unity. *Metascience* 22: 481–484.

Uebel, Thomas, and Robert S. Cohen, eds. 2004. *Otto Neurath: Economic Writings. Selections 1904-1945*. Dordrecht: Springer.

Vossoughian, Nader. 2008. *The Language of the Global Polis*. Rotterdam: NAi Publishers.

Watkins, J.W.N. 1974. Review of Neurath's Empiricism and Sociology. *The British Journal for the Philosophy of Science* 25 (4): 343–352.

Whyte, I.B. 2007. Otto Neurath and the sociology of happiness. In *Man-Made Future: Planning, Education and Design in Mid-Twentieth- Century Britain*, ed. I.B. Whyte, 16–38. London: Routledge.

Zolo, Danilo. 1989. *Reflexive Epistemology: The Philosophical Legacy of Otto Neurath*. Dordrecht/Boston: Kluwer.