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Introductory Textbooks in the Philosophy of Science: the Transformation of the Study Curriculum From 1937 to 2017[1]

Abstract

Philosophy of Science is a philosophical discipline that has been actively developing in the framework of English language philosophy since the 1920s. By the 1970s, PoS had become a well-institutionalized discipline taught in many American universities. The aim of this paper is to consider the introductory literature published in this field since then over the course of its historical development. We will follow the historical context in which the same textbooks emerge and reveal that the transformation of the canon is the most important contributor to the field by analysing the 10 anthologies issued from 1953 to 2006. As a result, we contend that the period of consolidation in the 1950s was§ replaced by rapid rotation in the 1980s. While some names (Carl Hempel) remained for a long time, some such as Karl Popper were long ignored.

1. Introduction

Philosophy of Science (PoS) is a philosophical discipline that was developed within the frame of English philosophy in the 1920s. By the 1970s, PoS had become a well-institutionalised discipline and took a regular place in the academic curriculum. With slightly less than a one-hundred-year history, the discipline has gone through several stages of development (Machamer 2002; Reisch 2005; Uebel 2010). Analysis of this history might be considered a key to the understanding of the development of this subdiscipline of philosophical knowledge.

Textbooks are a specific genre of academic writing. Philosophers of science were among the first to pay attention to the role of the textbook in the development of scientific knowledge (Fleck [1935] 1979, Kuhn 1963). However, if philosophers pay attention to textbooks in specific disciplines (Niaz 2014), then philosophy textbooks seldom become objects of historical-

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philosophical research. The exception may be an article by Till Grüne-Yanoff (2013), who critically analyses current textbooks in the Philosophy of Science.

We used an established but rare methodology for the analysis of textbooks in the Philosophy of Science. Here, we can name the classical work on the analysis of the school curriculum (Apple & Christian-Smith 1991) and a number of sociological studies of textbooks (for example, Babchuk & Keith 1995; Jeff, Sauder & Wright 2010). We also suggest using the formal methodology that was implemented in the analysis of textbooks from different fields of knowledge, such as sociology, psychology, and economics (Korom 2018).

It is important to note that the "Philosophy of Science", as a philosophical discipline, is largely an English-speaking enterprise. The number of introductory books on the subject, explicitly called "Philosophy of Science," is very low in non-English speaking domains. The difference in understandings of PoS was manifested in a book edited by Gary Gutting, with the ambitious title "Continental Philosophy of Science" (2005).

The goal of the paper is to investigate how the presentation of the fundamentals of PoS has transformed. To do so, we will examine how the textbooks in this subdiscipline have changed over time. The analysis of textbooks in the field of the Philosophy of Science should be conducted using mixed methods. First, one should provide a description of some basic biographic facts of the authors of the textbooks and their receptions. We are interested in the question of who the authors of the textbooks and anthologies were, especially in the early stage of the development of PoS as a discipline. It is a well-known fact that the approach of the discipline developed under the strong influence of members of so-called Vienna circles. This may shed light on how the ideas of Logical Empiricism have spread around English-language philosophy. Second, using some basic scientometric tools, we will analyse the 10 anthologies issued from 1953 to 2006 to reveal the transformation of the canon in terms of the most important contributors to the field. Adopting a focus on textbooks allows us to clarify the peculiarities of the text choice, personalities, and key problems.

2. Data and variables

Our analysis of the textbooks is based on data collected into two domains:

1. The aim of the first data collection is to obtain a comprehensive list of introductory literature into the philosophy of science, including textbooks such as introductions, anthologies, and companions.
This list will help clarify the dynamics of the production of textbooks in this field. The textbooks might be considered a result of a balance of the demand for a text that could be used for educational purposes, the interest of scholars who would be willing to write such texts and the interest of publishing companies to increase their revenue. The variety of titles and numbers of re-editions provide basic information about the trajectory of PoS as a scholarly product in settings of higher education.

PoS is a discipline that has typically targeted students who had already completed an introductory course in philosophy or studied science at an advanced college level. Thus, the border between textbooks as books written for educational purposes and books aiming to contribute to the academic debate is sometimes unclear. In some cases, we can deduce whether a book was written primarily for educational purposes by examining special headings, the preface, and reviews in central academic journals that describe the book as a textbook. We also take into account different types of textbooks: introductions, anthologies, and companions. We consider a total of 102 textbooks (including 18 re-editions).

2. The second collection of data covers names from the tables of contents of 10 anthologies printed from 1953 to 2006. According to our list of introductory literature, there are 15 original editions of anthologies, two of which have been republished twice and one of which has been republished three times. Some reeditions were published with minor changes, and some were published with major revisions. We obtained a representative sample from the tables of contents of 10 anthologies (9 original editions and one fully revised reedition).

3. Production of the Study Literature in Philosophy of Science

Tables 1 and 2 show the number of books on PoS by decade, according to the type or first edition and re-editions. According to the tables, the volume has increased since the 1980s. In this section, we will describe the main study literature emerging in the field of philosophy of science. Some authors are well-known scholars, but some innovators are completely forgotten philosophers. This review will provide a vivid context for understanding the dynamics of the discipline.

Table 1. Textbooks in Philosophy of Science by type.

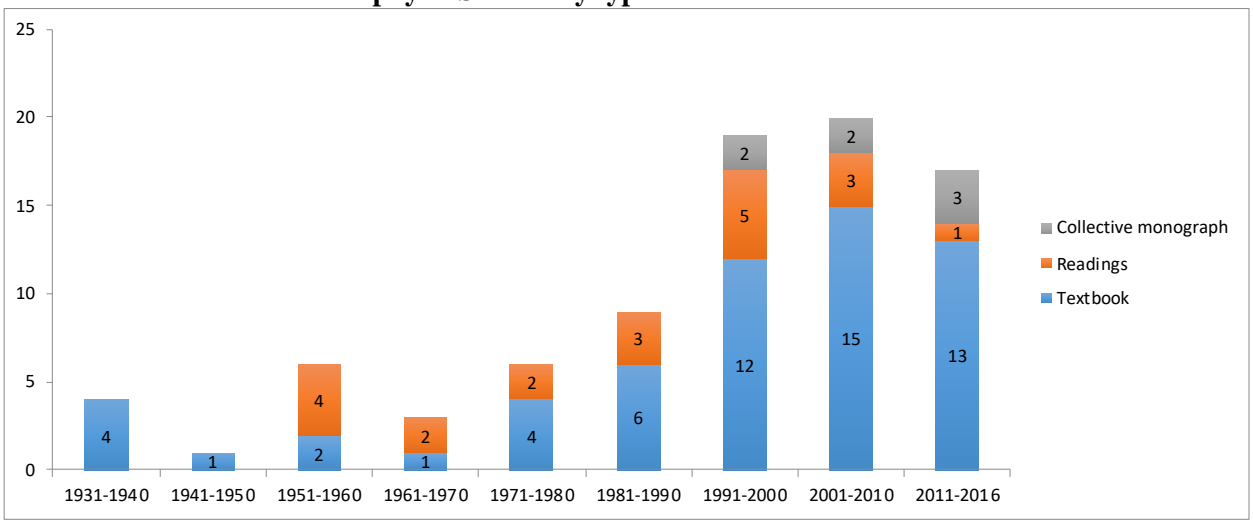
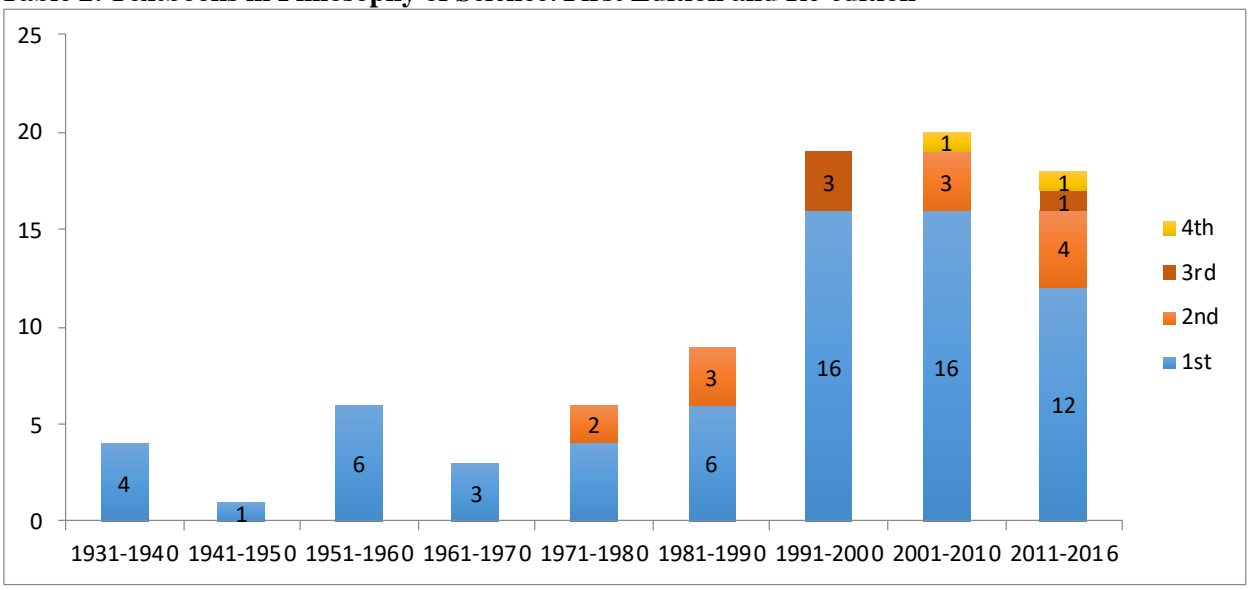


Table 2. Textbooks in Philosophy of Science. First Edition and Re-edition



It is difficult to say which book might be considered the first textbook on the philosophy of science. One of the first books that might qualify is "What is Science?", written in 1921 by an English physicist and philosopher of science, Norman Robert Campbell (1880–1949). This popularizing book inspired by the author's work at the Workers' Educational Association includes themes such as the relation of science to nature, laws and measurement. The topic set seems very similar to the modern approach to PoS. However, one of the earliest books titled "Philosophy of Science" does not resemble to Campbell's book.

As far as we can find, one of the earliest books in this gerne is a volume by philosopher and theologian Frederick Robert Tennant (1866 -1957), published by Cambridge University Press in 1932. This book consists of lectures presented by Tennant at Trinity College during the years 1931-1932. In these lectures, he sought to conjoin the natural sciences (the theory of evolution in

particular) with theology as various "departments of knowledge". The first book entitled PoS printed in the US also presents an attempt to combine religious views (in this case Catholic theology and scholastic philosophy) and modern science. It was written by an American bishop of the Catholic Church, Fulton Sheen, who later became notorious for his preaching on television (1934).

In considering the volumes by Tennant and Sheen, we can observe a sharp distinction between their approach to a new philosophical discipline and the approach presented in textbooks published in 1937 by the American Abram Cornelius Benjamin (1897—1968). Born near Michigan, he graduated from the University of Michigan, where he wrote a dissertation entitled "The Logical Atomism of Bertrand Russell". In 1932, he became an assistant professor at the University of Chicago. In 1945, he moved to the University of Missouri. When working in Chicago, he published "The Logical Structure of Science" (1936) and, one year later, "An Introduction to the Philosophy of Science". Both books covered topics that might be regarded as core topics of contemporary philosophy of science, such as meaning, models, description, explanation, and quantitative methods.

Both books received a warm reception. Reviewing the first book, William Marias Malisoff called it "a most modern" book and said that the position of Benjamin might be called "critical positivism" (Malisoff 1937, 385). The second book was reviewed by Ernest Nagel, who, together with Morris Raphael Cohen, had published a pioneering book on the scientific method two years earlier. Nagel praised the book as being good material for "teachers of the philosophy of science" (N., E. 1937, 612).

In the 1940s, only two books were published, in 1940, by German-educated William H. Werkmeister (1901-1993) and in 1942 by Albert Gustav Ramsperger (1898 – 1984). The first book was not truly popular and received mixed reviews. Ramsperger, along with Benjamin, pretends to be the first American philosopher who established a consistent course in the philosophy of science. According to Marcus Singer, Ramsperger's course in PoS was one of the first such courses established in the country (Singer 1984, 87). The book offers a short tour through the history of the creation of modern science, following chapters on the general characteristics of scientific knowledge; on causality, the procedure of deduction and induction; on probability and statistical laws; on the procedure of measurements; and on biological science. A chapter on determinism, free will, and morals and one on science and human values complete the work. His book

Philosophy of Science, published by Crofts in 1942, was for a long time a standard work on the subject, receiving wide use as a text and was translated into Spanish and Japanese.

According to Tables 1 and 2, from 1951 to 1970, the number of books did not increase significantly compared to the previous two decades (from 5 to 9). However, we see a new type of introductory literature – anthology, or readings – a collection of selected writings by various authors. 1953 is a milestone for this period. At this time, two readings were simultaneously published. One by Herbert Feigl, an early member of the Vienna Circle, and his young colleague May Brodbeck, first of the University of Iowa, and by the time of the publication, the University of Minnesota, the other reading was published and edited by Philip P. Wiener.

It is a well-known fact that Herbert Feigl, who founded, in 1953, the Minnesota Center for the Philosophy of Science, and Philip P. Wiener, who co-founded the Journal of the History of Ideas, played a prominent role in institutionalizing PoS as a special field and promoting logical positivism as a philosophical movement. Both volumes received good reviews, and as one reviewer put it, "These two anthologies furnish one of the best bases for the question: is there a philosophy of science?" (Strehler 1955, 50).

The Scientific Revolution, published by Thomas Kuhn in 1962, changed the landscape of the philosophy of science. However, this was not the case for the introductory literature. During this decade, only two volumes were published, both in 1968. One is a collection of papers from recent decades, i.e., since 1958, edited by Peter H. Nidditch, and the other is lectures by scholar of logical positivism Rudolf Carnap. Interestingly, in his book, Rudolf Carnap did not mention either Popper or Kuhn.

In the 1970s and 1980s, we can see rapid growth in the number of books. The real difference, however, is the emergence of re-editions. New phenomena in the literature of PoS may be considered a signal of the transformation of this subfield of philosophy. Two books were especially successful and survived four editions each (Losee 1972; 1979; 1992; 2001, Chalmers 1976; 1982; 1999; 2013) and were translated into more than 10 languages.

The emergence of a high-demand introductory book might be considered a result of the growing popularity of the subject. Tables 1 and 2 show the boom in textbooks in PoS that has occurred since 1991. Additionally, we can trace the development of this field genre – collective

monographs. To analyse a more recent period in which many different books are circulating simultaneously, we will apply a more formal analysis in the next section.

In summary, we can draw the following conclusions:

1. There was a concurrence between two approaches of the philosophy of science, one as a discussion on the possibility of combining science and religion and the other as a philosophical discussion on scientific methods.
2. The authors of earlier popular introductions in the philosophy of science, such as Abram Benjamin and Albert Ramsperger, were not directly related to the Vienna circle.
3. The fact that introductory books in PoS emerged in the 1970s that were republished several times during the next three decades allows us to conclude that this is a period when the conventional basis of the discipline was formed. However, during the 1980s, the number of published materials was quite similar to that in the previous decade (5 to 6). A significant increase has been observed only since 1991.

4. Readings in the philosophy of science: the key authors

To describe the dynamics of the canon, i.e., the rotation and diversity of the key authors in this academic discipline, we will analyse the composition of the authors whose papers or texts were selected for publication in anthologies.

The anthologies contain from 23 to 46 names of the authors whose papers or texts were selected to published. Having the lists of names from two different anthologies, we can find the names common to both books. Tables 3 and 4 break down the information on the intersection of names among all 10 anthologies. Table 3 shows the intersection of names in absolute numbers, and Table 4 shows the intersection of names as the ratio between all names in an anthology and names that overlap with other volumes.

Table 3. The intersection of names in absolute numbers

	Philip P. Wiener 1953	Feigl, May Brodbeck 1953	Danto and Morgenbesser 1960	Brody 1970	Brody 1989	Boyd, Gasper, Trout 1991	Klemke 1998	Schick 2000	Balashov, Rosenberg 2001	Lange 2006
Philip P. Wiener 1953	-	31	7	6	4	4	3	3	2	1
Feigl, May Brodbeck 1953	31	-	9	7	6	7	3	4	3	2
Danto and Morgenbesser 1960	7	9	-	7	7	4	3	5	1	2
Brody 1970	6	7	7	-	14	5	8	8	2	5
Brody 1989	4	6	7	14	-	13	11	16	4	10
Boyd, Gasper, Trout 1991	4	7	4	5	13	-	9	13	4	13
Klemke 1998	3	3	3	8	11	9	-	12	5	6
Schick 2000	3	4	5	8	16	13	12	-	5	8
Balashov, Rosenberg 2001	2	3	1	2	4	4	5	5	-	4
Lange 2006	1	2	2	5	10	13	6	8	4	-
Note: total number of names	*34*	*42*	*23*	*35*	*34*	*34*	*32*	*46*	*27*	*29*

Table 4. The intersection of names as the ratio between all names in an anthology and names that overlap with other volumes.

	Philip P. Wiener 1953	Feigl, May Brodbeck 1953	Danto and Morgenbesser 1960	Brody 1970	Brody 1989	Boyd, Gasper, Trout 1991	Klemke 1998	Schick 2000	Balashov, Rosenberg 2001	Lange 2006
Philip P. Wiener 1953	-	73,8%	30,4%	17,1%	11,8%	11,8%	9,4%	6,5%	7,4%	3,4%
Feigl, May Brodbeck 1953	91,2%	-	39,1%	20,0%	17,6%	20,6%	9,4%	8,7%	11,1%	6,9%
Danto and Morgenbesser 1960	20,6%	21,4%	-	20,0%	20,6%	11,8%	9,4%	10,9%	3,7%	6,9%
Brody 1970	17,6%	16,7%	30,4%	-	41,2%	14,7%	25,0%	17,4%	7,4%	17,2%
Brody 1989	11,8%	14,3%	30,4%	40,0%	-	38,2%	34,4%	34,8%	14,8%	34,5%
Boyd, Gasper, Trout 1991	11,8%	16,7%	17,4%	14,3%	38,2%	-	28,1%	28,3%	14,8%	44,8%
Klemke 1998	8,8%	7,1%	13,0%	22,9%	32,4%	26,5%	-	26,1%	18,5%	20,7%
Schick 2000	8,8%	9,5%	21,7%	22,9%	47,1%	38,2%	37,5%	-	18,5%	27,6%
Balashov, Rosenberg 2001	5,9%	7,1%	4,3%	5,7%	11,8%	11,8%	15,6%	10,9%	-	13,8%
Lange 2006	2,9%	4,8%	8,7%	14,3%	29,4%	38,2%	18,8%	17,4%	14,8%	-

Table 5. The Lists of authors who were included in anthologies three times

Name	Philip P. Wiener 1953	Feigl, May Brodbeck 1953	Danto, Morgenbesser 1960	Brody 1970	Brody 1989	Boyd, Gasper, Trout 1991	Klemke 1998	Schick 2000	Balashov, Rosenberg 2001	Lange 2006	Grand Total
Hempel	+	+	+	+	+	+	+	+	+	+	10
Carnap	+	+	+	+	+	+	+	+			8
Oppenheim	+	+	+	+	+	+		+			7
Nagel	+	+	+	+	+						5
Russell	+	+	+	+					+		5
Watkins	+	+		+		+					4
Campbell	+	+		+							3
Reichenbach	+	+	+		+	+				+	6
Poincare	+	+	+		+						4
Duhem	+	+	+					+			4
Schlick	+	+				+			+		4
Grunbaum	+	+	+								3
Mach	+	+	+								3
Frank	+	+					+				3
Kuhn				+	+	+	+	+	+	+	7
Hanson			+	+	+		+	+	+		6
Salmon				+	+		+	+	+	+	6
Feyerabend				+	+		+	+	+		5
Maxwell				+	+		+	+			4
Goodman				+	+					+	3
Achinstein				+	+						2
Fraassen					+	+	+	+	+	+	6
Laudan					+	+		+	+	+	5
Cartwright					+	+	+			+	4
Hacking					+	+		+		+	4
Putnam					+	+	+	+			4
Churchland					+	+		+			3
Fine					+	+		+			3
Glymour					+	+				+	3
Kitcher						+	+	+	+	+	5
Fodor						+		+		+	3
McMullin							+	+	+		3
Popper						+	+	+	+		4
Quine						+	+		+		3

The analysis begins with anthologies edited by Wiener (1953) and Feigl & Brodbeck (1953). Wiener (1953) includes 34 authors and Feigl & Brodbeck (1953) 42. The two publications have 31 authors in common. While Feigl & Brodbeck (1953) have a larger number of authors, the 31 authors shared with Wiener (1953) constitute 73.8% of them; the 31 shared with Feigl & Brodbeck (1953) constitute 91.2% of the overlapping names in Wiener (1953). This finding allows us to say that although the publications do not depend on one another, they exhibit similar ideas by choosing the main authors in the emerging field of philosophy.

However, the vast majority of the authors selected for an anthology published in the early 1950s do not repeat in later editions. Published only seven years later, Danto & Morgenbesser (1960) has only 7 overlapping names with Wiener (1953) and 9 overlapping names with Feigl & Brodbeck (1953). The same scale of changes occurred in the next decade. The volumes by Danto & Morgenbesser (1960) and Bodly (1970) share only seven names. As we can see, the number of common authors between Danto & Morgenbesser (1960) and subsequent editions that followed, namely Bodly (1970) and Bodly (1989), fluctuated between 1 and 2.

The anthology edited by Brodly presents a special interest because the second edition published in 1989 represented a major revision from the first edition published in 1970. The overlapping names in these two editions reach only 40% (14 common names between the 34 names in the edition of 1970 and 35 names in the edition of 1989). This reflects rapid changes that occurred during the nearly two decades between editions. However, the anthologies published in the 1990s and 2000s have more in common with Brodly (1989) than the books from the previous period.

In comparing the authors included in Brodly (1989) with those in Boyd, Gasper, Trout (1991), we have 34 scholars with 13 overlapping names or 38.2%. As we can see, the proportion of overlapping names between Brodly (1989) and Boyd, Gasper, Trout (1991) from one side and Schick (2000), Lange (2006) from another range from 28.3 to 34.5%. It is reasonable to interpret this increased similarity in authors included in these books as the stabilization of the main canon of PoS around this time.

Balashov & Rosenberg (2001) is situated in contrast to the other 5 anthologies produced from 1989 to 2006. The proportion of overlapping names does not reach 20%. Even though Lange (2006) was published only 5 years after Balashov & Rosenberg (2001), they have only 4 authors

in common. To clarify the dynamics by which authors enter or exit the cannon of PoS, we provide Table 5, which lists the names of philosophers who were included in anthologies three times. Only 14 philosophers whose papers have been included in two anthologies since 1953 continued to be present in at least one additional anthology. Only Carl Gustav Hempel (1905 – 1997) is included in all 10 anthologies. However, some of scholars, such as Duhem and Schlick, reemerged in the canon after 1991. Interestingly, only one scholar, first introduced by Danto & Morgenbesser (1960), namely, Norwood Russell Hanson (1924-1967), has occupied a stable place in the canon.

Brody-edited anthologies in our database show new waves of authors who are being anchored in the canon. The most complete is Brody (1989), which includes 21 names that appear in our database three or more times. It is followed by Boyd, Gasper, Trout (1991) and Schick (2000), with 19 surnames each. Thereafter, Thomas Kuhn, Wesley Salmon and Bas Van Fraassen are included in the canon. Laudan appeared in 1989 slightly earlier than Kitcher (1991), but once they appeared, they did not disappear. However, most strikingly, Karl Popper and W. V. O Quine entered the canon in late 1991. Additionally, anthologies have also ignored the neighbouring field of sociology of science: Steve Woolgar and David Bloor appear only once each in Schick (2000) and Balashov & Rosenberg (2001).

Concussion

According to Machamer (2002), the history of PoS might be broken into three periods: 1918–1950s: Logical Positivism to Logical Empiricism; the 1950s through the 1970s: New Paradigms and Scientific Change; and Contemporary Foci: What is "hot" today. By considering the entry and rotation of the names of scholars in the canon of introductory literature, we aim to justify or refine this periodization.

The authors of earlier popular introductions in the philosophy of science, such as Abram Benjamin and Albert Ramsperger, were not directly related to the Vienna circle. However, their textbooks offer a clear curriculum for teaching PoS in line with the approach of logical positivism. The successful books on PoS written by American-born philosophers may partly explain the reputation that the ideas of the Vienna circle came to possess in the US.

At the beginning of the 1950s, we can observe serious consolidation that fell apart circa 1970. In the 1970s-1980s, we can see new names in the canon that cannot be covered by the labels of New

Paradigms and Scientific Change. A significant increase in the number of introductory studies in the field has been observed only since 1991. In this period, considerable stabilization of the canon occurred. Some names, such as Russell, Campbell, Duhem, and Schick, received new relevance, and some, such as Popper, entered the canon after having long been ignored.

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