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History of Philosophy in Ones and Zeros

Arianna Betti, Hein van den Berg, Yvette Oortwijn and Caspar Treijtel

Introduction

This chapter presents the new field of 'data-driven history of philosophy' or 'computational history of philosophy' as a branch of the digital humanities. The field is at present rather small: up to now, philosophers have not been much involved in digital humanities projects (Bradley 2011; see also van den Berg et al. 2014; Betti, Reynaert, and van den Berg 2017). Exceptions include Overton (2013) who uses text mining techniques from natural language processing to discover patterns in the usage of the term 'explain', and Andow (2015) who provides a qualitative study of two corpora in order to examine instances of intuition talk. In addition, Fischer et al. (2015), who clarify the epistemological relevance of

The authors' contribution is as follows: Arianna Betti (corresponding author) had the initial idea, did background qualitative research and collected existing hypotheses, set up and designed the research, carried out analysis of years 1888–1937, wrote the abstract, Sections 'Introduction' and 'Method and corpora', and co-wrote Sections 'The bigram "conceptual scheme" from 1888 to 1959 in psychology and sociology' and 'The spread of the notion of conceptual scheme: Preliminary findings and strengths and limitations of the method'; Hein van den Berg (Annotator 1) contributed to shaping the research, structured the paper, co-wrote Section 'The bigram "conceptual scheme" from 1888 to 1959 in psychology and sociology' and 'The spread of the notion of conceptual scheme: Preliminary findings and strengths and limitations of the method', and carried out analysis of years 1937–1959. Yvette Oortwijn (Annotator 2), contributed to data collection and data analysis for the background research, gathered secondary literature, set up tables, curated references, and carried out analysis of years 1888–1959; Caspar Treijtel collected the digital corpus including metadata, set up the search interface, and liaised with library staff responsible for licensing.

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Thanks to Julia Turska for attracting our attention to the 1981 Quine quote in Section 'Method and corpora'; to Jelke Bloem, Anna Bellomo, Lisa Dondorp, Silvan Hungerbühler, Maud van Lier, Thijs Ossenkoppele and Pauline van Wierst for discussion and valuable comments. Silvan also calculated for us Cohen's Kappa, Jelke ran the chi-squared test, and Lisa provided us with many valuable editing suggestions. Thanks also to Janneke Staaks, Lidie Koeneman and Marcel Ottenbros from the Library of the University of Amsterdam for help with licensing and data harvesting. The data that we have harvested was collected with the support and permission provided by the publishers of the investigated publications, Taylor & Francis (tandfonline.com), Ovid/Wolters Kluwer (ovid.com) and JSTOR (jstor.org).

empirical findings about intuitions, and include a distributional semantics analysis of appearance words in Wikiwoods[1] to support reconstruction of arguments in historical texts. Alfano (forthcoming) uses digital humanities techniques in order to track Nietzsche's use of the terms 'drive', 'instinct' and 'virtue'.[2]

The relative lack of historians of philosophy involved in 'data-driven history of philosophy' is regrettable; valuable results can be obtained by applying even rather simple, well-known computational techniques to philosophically relevant texts (van Wierst et al. 2016). The present chapter is a further confirmation of the potential of using even more basic computational means to gather and set up access to data for philosophers to evaluate. We demonstrate the utility of a computational and data-driven approach in philosophy by providing a computational study of the spread of the notion of *'conceptual scheme'*. Investigating the history of a concept can contribute to a core technique of philosophy – *conceptual analysis*. Understanding the origins of a concept improves understanding of the notion itself and the identification of related ideas when the corresponding labels appear in a text (i.e. what the author intended by 'conceptual scheme'). Understanding the origins and development of a concept is key to correct interpretation of a text.

'Conceptual scheme' is one of the most intriguing notions in 20th century analytic philosophy and general philosophy of science. Roughly, the expression labels the ordinary notion of a perspective on the world. It appears inn a celebrated 1973 article by Donald Davidson (Davidson 1973), is central to W. V. Quine's thought (see, e.g. Quine 1960), and plays a key role in the work of Thomas Kuhn, in which it appears as both 'conceptual scheme' (Kuhn 1957) and – famously – 'paradigm' (Kuhn 1962), It is also of interest to other disciplines contributing to cognitive science, as it is related to *'schema'* in cognitive psychology (Rumelhart 1980) and *'frame'* in artificial intelligence (as introduced by Minsky 1974; see also Mey 1982: 106). Despite its importance, its origin, development and spread both inside and outside philosophy are still unclear.

Although integral to many of the arguments Quine puts forward, Quine nowhere defines or characterizes the expression 'conceptual scheme' as a technical term. The first occurrence in Quine, to our knowledge, is in Quine (1934), where the way he works with it suggests that he takes his audience to be thoroughly familiar with the phrase. If readers were familiar with the notion prior to reading Quine, its origin cannot be in Quine's work.

[1] http://moin.delph-in.net/WikiWoods

[2] See also this report on the first conference on data-driven history of philosophy (Torino, January 2017): https://dr2blog.hcommons.org/2017/06/23/dr2-conference-a-not-too-late-report/.

Traditional research in philosophy, psychology and sociology has put forward at least three hypotheses about the originator of 'conceptual scheme': William James (1843–1910) (Mey 1982, 25); Jean Piaget (1896–1980) (Preston 2008; Mey 1982, 106, 229), and Vilfredo Pareto (1848–1923) (Isaac 2012, 70). The Pareto hypothesis involves the mediation of Lawrence J. Henderson (1878–1942), a leading biochemist by training, and a key figure in the Harvard administration, who fostered both the general interdisciplinary climate in which Quine, a Harvard PhD, developed academically, and the specific reflection on the social sciences that took place in 1920s-30s Harvard. The three competing hypotheses have been independently formulated within (sub)fields in the social sciences and humanities (e.g. Mey 1982 does not mention Quine at all), and no attempt at a comprehensive study at an interdisciplinary history of the notion of conceptual scheme is to date available.

In this chapter we take a first step toward such a comprehensive study by focusing on one aspect of the Pareto hypothesis, namely the spread of a notion of 'conceptual scheme' we call '*Hendersonian*': we find it in about 42,000 articles from eight US psychology and sociology journals from 1888 to 1959. We assess the hypothesis by combining a quantitative procedure aided by basic computational techniques with qualitative elements informed by what Betti and van den Berg (2014) have previously called the 'model approach to the history of ideas'. We highlight practical and methodological issues arising from the use of this novel method, and formulate recommendations and plans for future work in this field.

Method and corpora

How do we find out where or from whom the notion of 'conceptual scheme' originated, how it has developed and the way it has, possibly, spread to disciplines other than the ones in which it originated? Traditional studies in the history of philosophy usually tackle questions such as this by qualitative analysis. The method typically adopted by these studies consists in careful, in-depth reading of a small number of primary sources (such as a selection of works by Quine, and/or James, Pareto, Henderson, and Piaget) combined with (sometimes less in-depth) reading of a certain number of secondary sources (e.g. works such as Mey 1982; Preston 2008 and Isaac 2012), which are used as interpretive guides to the primary sources. Textual passages that are deemed relevant for answering the research question at issue are then usually lifted from some of these sources, transcribed literally in the paper and offered as evidence for the historical findings presented. One such passage might be this:

> Let me clarify the status of the phrase. I inherited it some forty-five years ago through L. J. Henderson from Pareto, and I have meant it as ordinary language, serving no technical function. (Quine 1981, 41)

A selection of the sources actually used in the research are referred to in the various sections of the paper, and their metadata is recorded in the bibliography section.

In traditional studies of this kind, the concept of a properly delineated and well-delimited corpus serving as the explicit textual basis for the research is rather alien. Once the set of primary and secondary sources actually used (as well as those to be *ideally* used) is specified, however, it becomes clear that the quantity of source-material a researcher following the traditional method could possibly process is rather small. Thus traditional research can deliver investigations only on a small scale. This also means that wide-scope claims such as:

> … the conceptual scheme rapidly became such a pervasive idea in anglophone philosophy of science that it is hard to find a programmatic statement about science in the 1950s or 1960s without it (Galison 1997, 788),

… which are common and generally accepted by peers, should not be taken literally, because not every relevant source is taken into account. Tracing the development of a concept across multiple disciplines through several decades isn't a small-scale research goal, and cannot be tackled via analysis of the sort that is adequate in those cases. What is more, the small-scale analysis intrinsic in traditional research carries within itself a limitation of the research field that tends to lead, inevitably, to an inward-looking, monodisciplinary attitude towards the available spread of evidence. The evidence in question tends to be selectively identified with the writings of a few known authors that are transmitted from generation to generation of scholars as *the* authors to read, the presumption being that these authors are the most influential in the relevant field.[3]

By contrast with the traditional method of investigation, in the present chapter we rely on (1) a well-delimited, explicitly stated digital corpus of 41,462 articles from a selection of US journals in psychology and sociology, to which we apply, aided by a (2) very basic computational means, a novel approach consisting in a mix of (3) qualitative and (4) quantitative analysis. We give details on each of (1)-(4) here below.

[3] See on this point also Green et al. 2013; Sangiacomo 2018 [~~forthcoming~~]. See also https://historyofphilosophy.net/rule-5-history-philosophy-take-minor-figures-seriously

(1) To construct the corpus that we use, we started by singling out *The Psychological Review* (founded in 1894) as a journal representative of the field of psychology in the United States. This was one of the most significant and prominent early American journals of psychology as a separate discipline (Green et al. 2013, 169; 2015, 16). A quick perusal and assessment of a simple search for 'conceptual scheme' in the years 1895–1960 of *The Psychological Review* (for details see (2) below), seemed to point to a focus of use in the field of *social psychology*: so we decided to expand the corpus to seven journals in the social sciences: *American Journal of Sociology, American Sociological Review, Journal of Social Psychology, American Catholic Sociological Review, Sociometry, (Journal of) Social Forces* and *American Anthropologist*. One pragmatic reason to select these seven journals, alongside our wish to use as many journals in sociology and social psychology as possible, is that access to these was reasonably quick and easy (for details on data access see again (2) below). Other reasons include that *The American Journal of Sociology* and *American Sociological Review* were the top two journals in US sociology in the period: the former, founded in 1895, was the first sociology journal in the world and was dominated by the so-called Chicago school, while the latter was founded in 1936 as a reaction to the former (Lengermann 1979; Kinloch 1988, 190). The *Journal of Social Forces* (founded in 1922, later *Social Forces*) was the third major outlet in sociology. *Sociometry* (founded in 1937, later *Social Psychology Quarterly*), belongs to a subsequent cluster of more specialised sociology journals. The *American Anthropologist* (founded in 1888) expanded our coverage to anthropology, given the fluidity of the disciplinary borders in the social sciences in the period. The full ~~table~~ of our

Table 10.1 Articles per journal in the full corpus.

Title	Dates	No. of Articles
American Journal of Sociology	1895–1959	12,361
American Anthropologist	1888–1959	8,614
American Sociological Review	1936–1959	6,257
Social Forces (*Journal of Social Forces*)	1959	5,724
The Psychological Review	1894–1959	3,396
American Catholic Sociological Review	1940–1959	2,784
The Journal of Social Psychology	1930–1959	1,324
Sociometry (*Social Psychology Quarterly*)	1937–1959	1,002

journals with the year of foundation, and the total count of articles published per journal ~~follows:~~

Note that although a total 41,462 journal articles might appear to be a massive corpus from the point of view of traditional research, the corpus is still very limited for our purposes – as we explain more in detail in Section 'The spread of the notion of conceptual scheme: Preliminary findings and strengths and limitations of the method'.

(2) To collect the 41,462 journal article corpus and make it searchable and accessible in a user-friendly manner to our group, we approached the library of our university for aid with licensing and for technical support, which consisted in automatically downloading the articles, indexing them and setting up a simple interface based on the eXtensible Text Framework (XTF), an open source platform for access to digital content.[4] This kind of support is likely to be necessary for any other research group to download thousands of articles from more than one journal, plus the time-consuming process of seeking general agreement from several publishers and individual licenses for thousands of articles. We used two different approaches to download the corpus. For *The Journal of Social Psychology* and *The Psychological Review* we downloaded the total number of journal articles (4,720). For the remaining 36,742 articles from the other six journals, since they are all hosted on JSTOR,[5] we decided to exploit JSTOR's 'data for research' facility.[6] This entailed downloading the full dataset of bigrams from the remaining six journals: for each of the 36,742 articles from *American Journal of Sociology, American Sociological Review, American Catholic Sociological Review, Sociometry, Social Forces* and *American Anthropologist*, we downloaded, courtesy of JSTOR, a.txt file containing all the possible bigrams, for example, two-word adjoining combinations present in the full text of the article. For example, for article 10.2307_277013, the list of bigrams starts as follows (the reader might quickly notice the spacing problem in the fourth and fifth entry, which is likely an OCR mistake caused by end-of-line splits; more on this in Section 'The spread of the notion of conceptual scheme: Preliminary findings and strengths and limitations of the method'. below):

'social disorganization': 40
'group breakdown': 12

[4] https://xtf.cdlib.org/
[5] https://www.jstor.org/
[6] https://www.jstor.org/dfr/?cid=dsp_j_dfr_01_2018&utm_source=jstor&utm_medium=display&utm_campaign=home_right_jstor_dfr

'we can': 11
'dis organization': 10
'disorgani zation': 8

Second, for each article containing the string 'conceptual scheme' anywhere in its full text (so occurrences of 'conceptual scheme' and 'conceptual schemes' were included, but not of 'conceptual schemata'), we extracted the URLs of the corresponding.pdf, and downloaded the.pdf file manually from JSTOR. This gave us a harvest of 367 articles. We then uploaded, indexed and made accessible on the XTF interface those 367 articles, together with the 4,720 articles from *The Journal of Social Psychology* and *The Psychological Review* unfiltered for 'conceptual scheme', and of which 23 contained the bigram 'conceptual scheme' (note that this data mix between the filtered and the unfiltered sub-datasets is harmless, since for our analysis we decided to search only for the bigram 'conceptual scheme' and nothing else). The XTF interface offered a search function over the text layer of the.pdf files, and faceted searches for journal titles and year of publication. No conversion of the pdfs to other formats was conducted.

(3) After gathering the corpus, we set up the qualitative part of the research, guided by the aim to have a way to interpret the data. Setting up the research in this way, so that the qualitative aspect guides the quantitative aspect of the research, conforms to a programmatic claim made in previous work (Betti and van den Berg 2016). The most important trait of the qualitative approach we adopt is its explicit nature, insofar as we employ an explicit – if rather rudimentary – model of (a particular conception) of conceptual scheme, which we use as a qualitative framework of interpretation for the quantitative research.[7] This is a model in the sense of Betti and van den Berg (2014).[8] In general, Betti and van den Berg's models represent ideas as complex relational structures with both stable (*continuity*) and variable (*discontinuity*) elements. Sophisticated shifts of meaning of ideas (concepts) through time can thus be measured as (dis)similarities between the stable and variable parts of such structures. This enables modelling of fine-grained discontinuities within a big picture of large-scale conceptual continuity enabling us to represent constantly shifting conceptual perspectives. The model approach is well suited to provide a proper

[7] For a similar approach see Sangiacomo 2018 ~~[forthcoming]~~, which in turns builds upon Betti and van den Berg 2014, 2016.

[8] In the following, we discuss the model approach as presented in Betti and van den Berg 2014 and Betti and van den Berg 2016. For a full account of the model approach, the reader is referred to the papers just mentioned.

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theoretical foundation for tracing ideas computationally because it affords an ideal theoretical balance between fine-grained conceptual analysis and large-scale pattern finding.

In previous work, authors Betti and van den Berg have utilized a model of a traditional ideal of (axiomatic) science called the 'Classical Model of Science' (de Jong and Betti 2010). The Classical Model of Science models the idea of axiomatic science as a complex relational structure composed of seven conditions containing 10 sub-ideas or sub-concepts. This model is an interpretative tool on the basis of which continuities and discontinuities in the history of a particular idea of science can be studied.

For the present chapter, we have constructed a rudimentary model of a (particular conception of) the idea or concept of *conceptual scheme* that we have distilled – largely working by abduction – from Henderson (1932) – hence 'Hendersonian' – and which we identified with a minimal cluster of two conditions taken to be *necessary* to the notion (we say nothing about these conditions being also possibly *sufficient*):

(1) a (proper) science has a conceptual scheme;
(2) a conceptual scheme is a/the (or a part of the) theoretical framework of a (proper) science in terms of which empirical phenomena, facts or data are interpreted.

Both of these conditions can be said to also apply to the idea of conceptual scheme endorsed by Quine (e.g. Quine 1992 – given a broad enough reading of 'part of' and 'theoretical framework'). Note that the model in question is minimal, resulting in a broad conception fitting many variants of the notion of conceptual scheme, though it is not so broad as to fit, trivially, any conception whatsoever.[9] For example, naive realist theories holding that facts impose themselves on us and cannot thus be said to be 'interpreted' are excluded by the second condition, which includes the sub-concept of fact and/or data as *interpreted*. Note also that, as is the case in the Classical Model of Science, the model just sketched is highly abstract: the sub-concepts (e.g. *empirical phenomena, facts* or *data*) involved are determinables, and might be specified by different authors using different technical terms or sub-concepts. For instance, not everybody adhering to the model of conceptual scheme just sketched accepts facts (and the term 'fact' as a technical or semi-technical one), although everybody adhering to that model would accept that *some* items in their universe play at least some of the roles that facts play when they are accepted. Such

[9] This is in keeping with de Jong and Betti 2010, 191, 196.

items might be called 'data', 'phenomena', 'observations', etc. However, the relation between such items and a conceptual scheme seems most important: a conceptual scheme is that in terms of which the items in question are interpreted.

(4) For the quantitative analysis: we manually constructed a derived dataset (in a spreadsheet) containing the following nine fields (mostly article metadata):

Journal title,
Article title,
Author name,
Year of publication,
Affiliation/location of Author at time of publication,
Discipline of affiliation of Author,
Qualitative notes, including academic career info, degrees, and other biographical notes
Context (passage of text) in which the Author uses the term 'conceptual scheme'
Annotation

The 'Annotation' field contains the annotator's *evaluation* of the Context (passage of text). We used two types of annotations: (A) the annotators indicated whether the Hendersonian notion appeared in the passage (Yes), either perhaps or vaguely appeared (Maybe) or was absent (No). That is, *Yes* means that the bigram 'conceptual scheme' is used in, or presupposes, the meaning fixed by our Hendersonian model. (B) the annotators indicated whether the passage provided philosophical or theoretical analysis, or additional information on the notion of *conceptual scheme* itself, instead of a mere use or application. Two expert annotators carried out both (A) and (B) independently for each passage. By adopting a model of the notion we set out to trace, we were able to interpret the substantial quantity of journal articles at our disposal more quickly. We could assess whether the article put forward the particular conception of conceptual scheme fixed by our model, and obtain a quantitative measure of it.

The bigram 'conceptual scheme' from 1888 to 1959 in psychology and sociology

The corpus shows a total of 367 articles including the bigram 'conceptual scheme' (about 0.9% of the total of articles published) in the eight journals we considered, authored by 287 different individuals at 133 different institutions.

The *American Sociological Review* has by far the greatest number of articles using 'conceptual scheme' (about 30% of the total of 367), and Harvard University is the top affiliation of the authors who use the phrase. The 41 papers bearing a Harvard affiliation account for slightly more than 11% of the total. It is difficult to interpret the Harvard share adequately without normalising for the affiliation of the authors of *all* of the papers published in the period. Additionally, we would need to know how many sociology departments there were in US at the time, their staff count, and how many sociologists in general were active in the period. Nevertheless, we might observe the following: qualitative research states uncontroversially that the dominant US sociology department from the 1890s until World War II was at Chicago (Harvey 1987, Chapter 7; Abbott 2009, 18.1). If we wished to take this qualitative information into account, then our data is significant insofar as it shows that the number of Harvard papers using 'conceptual scheme' is twice that of Chicago, which is our second-ranked institution. Note that the situation varies per decade, as the gap between Harvard and the other institutions thins out: prior to the 1930s, only three papers used the bigram, and none of their authors was affiliated to Harvard. In the thirties, 12 out of the 24 articles were published by authors associated with Harvard (50%), whereas just two (less than 10%) were published by authors affiliated to that decade's second-ranked institution (Chicago again). In the 1940s Harvard ranked as the top affiliation again, with 18 papers out of 114 (about 16%), whereas the second-ranked, this time Fordham, counts half that number (9 out of 114 papers, about 8%). In the 50s Harvard was overtaken by Chicago, which tops the list with 14 papers out of 226 (about 6%), while Harvard ranks second with 11 papers out of 226 (about 5%). Furthermore, our annotation revealed that every article in which the phrase 'conceptual scheme' occurs (every article in our tables), uses it (or appears to use it) in the sense that we have called 'Hendersonian': to restate, *every* article in our tables expresses, or possibly expresses, the Hendersonian notion; we comment further on this in Section 'The spread of the notion of conceptual scheme: Preliminary findings and strengths and limitations of the method', below. One possible interpretation of this data is that the Hendersonian notion of conceptual scheme was a hallmark of Harvard sociology in the 1930s, and that it spread to other institutions in the course of three decades.

This hypothesis of the spread of conceptual scheme as a notion needs further refinement. For one thing, our data include a significant number of authors who had no formal Harvard affiliation at the time of publication, but had a Harvard history (below we call them 'invisible Harvardians'). Among the top 10 authors we find Talcott Parsons (Harvard), a major figure in the history of sociology,

Table 10.2 Articles in which bigram 'conceptual scheme' appears by journal.

Journal (Total 8)	Number of articles using 'conceptual scheme' (Total 367)
American Sociological Review	108
Social Forces	65
American Journal of Sociology	64
American Anthropologist	51
American Catholic Sociological Review	41
Psychological Review	17
Sociometry	15
Journal of Social Psychology	6

Table 10.3 Number of articles in which the bigram 'conceptual scheme' features by affiliation (threshold ≥ 5) of author.

Affiliation (Total 133) (threshold ≥5)	Number of authored articles using 'conceptual scheme'
Harvard	41
University of Chicago	16
Fordham	14
University of Michigan	10
Columbia	8
Ohio State	8
University of Wisconsin	8
Michigan state	8
Princeton	7
Indiana University	7
Northwestern University	6
University of California	6
University of Washington	5
Smith College	5
Cornell University	5
Catholic University of America	5
Rutgers	5
University of Colorado	5
University of Minnesota	5

ranking first with 14 papers, and 6 other (in)visible Harvardians (Timasheff, Kluckhohn, Davis, Moore, Merton, Devereux).[10] Thus, *70%* of the top 10 authors are Harvardians or invisible Harvardians. Taking the invisible Harvardians into account arguably leaves the 'spread' part of hypothesis untouched, while strengthening the 'Harvard hallmark' part. We come back to this point below.

In the remainder of this section, we break down our findings for the period prior to the 1930s, for the 1930s, the 1940s and the 1950s. We should signal that the decision to break the period up in this way has been conventional,

Table 10.4 Articles featuring use of 'conceptual scheme' by author.

Authors (~~T~~otal 287) (threshold ≥3)	**Number of authored articles containing 'conceptual scheme'**
Parsons, Talcott	14
Timasheff, Nicholas S.	10
Kluckhohn, Clyde	6
Davis, Arthur K.	5
Morris, Rudolph E.	4
Moore, Wilbert E.	4
Bain, Read	4
Merton, Robert K.	4
Devereux, George	3
Hartnett, Robert C.	3
Whyte, William F.	3
Strauss, Anselm L.	3
Riley, Matilda W.	3
Jurczak, Chester A.	3
Pellegrin, Roland J.	3
Seeman, Melvin	3
Loomis, Charles P	3
Brewer, Earl D.C.	3
Moreno, Jacob L.	3
Hallowell, A. Irving	3

[10] Note that our check for invisible Harvardians was done manually for each author, and depended on readily available information on the internet. The biographical details of some authors are not easily accessible.

but recognize that this decision might influence the analysis. We come back to this point briefly in Section 'The spread of the notion of conceptual scheme: Preliminary findings and strengths and limitations of the method', below.

Prior to the 1930s

From 1888 to 1929, we identified three journal articles containing the bigram 'conceptual scheme' (about 0.026% of the total).

The affiliations of the authors who use the phrase are collected in the table below, followed by a table with an overview of the authors who use the phrase.

Table 10.5 Journals featuring bigram 'conceptual scheme' before 1930.

Journal (Total 8)	Number of articles containing 'conceptual scheme' (total: 367 | total for the period: 3)
Psychological Review	2
Social Forces	1

Table 10.6 Articles containing 'conceptual scheme' by author affiliation (Prior to 1930).

Affiliation (total: 133)	Number of authored articles containing 'conceptual scheme' (total: 367 | total period: 3)
Bristol	1
Columbia	1
Lucknow	1

Table 10.7 Articles using 'conceptual scheme' by author, prior to 1930.

Author (total: 287)	Number of authored articles containing 'conceptual scheme' (total: 367 | total period: 3)
Morgan, Conwy L.	1
Haeberlin, Herman K.	1
Mukerjee, Radhakamal	1

The authors who use the phrase are, as we can see, Conwy Lloyd Morgan, a famous British ethologist and psychologist,[11] Herman K. Haeberlin, an anthropologist who studied under Franz Boas (Boas 1919), and Radhakamal Mukerjee, a leading Indian thinker and social scientist.[12] The earliest occurrences of the bigram within our corpus thus occur within the disciplines of psychology, anthropology and sociology.

Although these mentions of the phrase 'conceptual scheme' occur before 1932, the year Henderson developed the account of conceptual scheme on which we have based our model, we have annotated the occurrences in order to see whether they conform to the Hendersonian model. The reason for doing this is to see whether the model in question was anticipated prior to its formulation by Henderson, which might suggest that Henderson developed his account of conceptual scheme earlier, or under the influence of someone else or both. Both annotators scored one article (Haeberlin) as conforming to the Hendersonian model of conceptual scheme (Yes), and two articles (Morgan and Mukerjee) as maybe conforming to the Hendersonian model of conceptual scheme (Maybe). No article includes a philosophical elaboration of the notion. The interrater reliability (Cohen's Kappa) of both the question of whether the Hendersonian notion was contained in the articles and the question of whether the article included additional philosophical information was kappa = 1. Thus there is some scant evidence that the notion of conceptual scheme we are considering was already adopted prior to Henderson, but given the small dataset we are working with we cannot base any strong conclusions on this evidence.

If we consider the passages from a qualitative perspective, we may note that Morgan's and Mukerjee's are difficult to interpret, since they simply use the phrase without much elaboration or explanation. However, in Haeberlin's case the suggestion seems to be that a conceptual scheme must be interpreted as similar to (a part of) a (scientific) theory. This interpretation of the phrase 'conceptual scheme', which may be taken to conform to the Hendersonian model of conceptual scheme and which we also encounter in the 1940s and 1950s, is taken from the following passage:

> Wundt has devised a remarkable foundation of concepts upon which to build up a new science of the folk-soul. His concepts of the higher synthesis, the social mind, the reality of folk-psychological actuality, etc., are all seemingly firmly

[11] https://en.wikipedia.org/wiki/C._Lloyd_Morgan
[12] https://en.wikipedia.org/wiki/Radhakamal_Mukerjee

> anchored in a monumental philosophical system; but Wundt's conceptual scheme breaks down when applied (Haeberlin 1916, 301 [Y|Y|N|N][13]).

Here, the conceptual scheme of Wundt is interpreted as his philosophical system or as the structure of concepts upon which Wundt builds up a science of the folk-soul.

1930s

In the 1930s, our corpus shows 24 articles that contain the bigram 'conceptual scheme' (about 0.3% of the total) – about 11 times the number of papers with respect to the previous period (the increase is normalized per number of papers published). The journals in which we found the bigram are:

As we can see, while the phrase 'conceptual scheme' figures in the sociological literature of the 1930s, and we also find a mention in the *American Anthropologist*, there are *no* occurrences within the psychology journals of our corpus in this period.

The affiliations of the authors who use the bigram is presented in ~~the~~ table ~~below~~, followed by ~~a table with~~ an overview of the authors who use the bigram. Note that each author of a multi-author paper gets one article to their name.

Table 10.8 Journals in which 'conceptual scheme' appears, 1930s.

Journal (Total: 8)	Number of Articles containing 'conceptual scheme'-(total: 367| total period: 24)
American Sociological Review	11
American Journal of Sociology	9
American Anthropologist	2
Sociometry	1
Social Forces	1

[13] We append to each passage that we quote in our qualitative analysis a four-letter code for the score of Annotator 1 and 2 as to A and B. For instance: M|Y|Y|N stands for the circumstance that Annotator 1 scored the passage as maybe (M) containing the Hendersonian notion of conceptual scheme, and Annotator 2 scored it as containing it (first occurrence of 'Y'); moreover, Annotator 1 scored the passage as containing additional information (second occurrence of 'Y') and Annotator 2 scored the passage as not containing additional information (N).

Table 10.9 Articles using 'conceptual scheme' by author affiliation, 1930s.

Affiliation (total: 133)	Number of Articles containing 'conceptual scheme'
Harvard	12
University of Chicago	2
SSRC	1
Beacon Hill	1
Columbia	1
New York University	1
Smith College	1
University of Texas	1
Miami	1
Hawaii	1
Iowa	1
Ohio State	1
Yale	1
Chicago	1
University of Pennsylvania	1

Table 10.10 Articles using 'conceptual scheme' by author, 1930s.

Author	Number of Articles containing 'conceptual scheme'
Parsons, Talcott	5
Merton, Robert K.	3
Kluckhohn, Clyde	1
Young, Donald	1
Davis, Kingsley	1
Brinton, Crane	1
Moreno, Jacob L.	1
Timasheff, Nicholas S.	1
Bierstedt, Robert	1
Cressey, Paul G.	1
DeNood, Neal B.	1
Gettys, Warner E.	1
Burgess, Ernest W.	1
Winch, Robert F.	1

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Table 10.10 (*Continued*)

Author	Number of Articles containing 'conceptual scheme'
Lind, Andrew W.	1
Bain, Read	1
Reuter, Edward B.	1
Leighton, J[oseph] A.	1
Dollard, John	1
Dunham, Warren H.	1
Hallowell, A. Irving	1

Harvard is by far the top affiliation for authors who employ the bigram. This finding is consistent with the idea that the phrase was introduced in the sociological literature by (or via) Henderson at Harvard in the 1930s. Among the authors who use the bigram most frequently are the famous Harvard-affiliated sociologists Talcott Parsons (who uses it in five published articles in our journal corpus) and Robert K. Merton (who uses the bigram in three). If we now also add to the count the 'invisible Harvardians', namely authors with a different affiliation but with a Harvard degree or a Harvard history, we see that of the 21 names listed, a third are (invisible) Harvardians: Parsons, Merton, Timasheff, Kluckhohn, Davis, Brinton, and DeNood (Page 1985, 119).

Our annotation of the corpus gave the following results: out of the 24 articles, Annotator 1 scored 18 as articulating the Hendersonian notion of conceptual scheme (Yes), five articles as maybe articulating it (Maybe), and zero articles as not containing it (No). One passage was left without a score because it contained only a reference to another article with the bigram 'conceptual scheme' in the title. Moreover, four articles were identified as containing additional philosophical information on the notion, whereas 19 articles applied it without providing additional explanation. Annotator 2 scored 17 articles as articulating the Hendersonian notion of conceptual scheme (Yes) and six articles as maybe articulating it (Maybe), and zero articles as not containing it (No). Again, one article was left unscored. In addition, three articles were marked as containing additional information on the notion of conceptual scheme, and the other 20 articles as not containing additional information. The interrater reliability (Cohen's kappa) on whether the articles contained the Hendersonian notion of conceptual scheme was kappa = 0.89958159. The interrater reliability on whether the articles contained additional information on the notion of conceptual scheme was kappa = 0.868852459. These results indicate that a large

portion – either 75% (annotator 1) or 70.8% (annotator 2) – of the authors who use the bigram 'conceptual scheme' adopted the Hendersonian notion – 'Yes' to (A): furthermore, whenever the phrase was used, it was (possibly) to express the Hendersonian notion ('Yes or 'Maybe'). No single use of the phrase wasn't at least *possibly* Hendersonian ('No').

Having provided a quantitative analysis of the use of the phrase 'conceptual scheme' in our corpus, we may now turn to a qualitative analysis. It is striking that the use of the phrase in our corpus in the 1930s strictly follows the Hendersonian model. For example, as we have seen, condition (2) of the Hendersonian model fixes that a conceptual scheme is a/the (or a part of the) theoretical framework of a science in terms of which facts, data, or phenomena are interpreted. This conception is clearly articulated by Parsons:

> The relation between the relative and the non-relative aspects of scientific knowledge, in Weber's view, can best be illuminated by a somewhat further development of the subject. In the first place, the actual object or phenomenon which the scientist studies is not a 'fully concrete' reality but is a 'construction' which brings together in a coherent descriptive whole those aspects of concrete reality which are significant to the investigator. Such a construction Weber calls a 'historical individual.' The essence of his view is contained in the common current formulas that observation takes place 'in terms of a conceptual scheme,' 'within a frame of reference.' (Parsons 1936, 677 [Y|Y|Y|Y])

The sociologist Nicholas Timasheff, at the time also affiliated with Harvard, expresses the same idea while quoting Henderson: 'The sociology of law is a science based on observation. Observation means the description of facts in the terms of a conceptual scheme' (Timasheff 1938, 219 [Y|Y|Y|Y]). In a later paper, again in line with condition (2) of the Hendersonian model of conceptual scheme, Parsons licenses a conception of *data* and (scientific) *facts* as something which is stated in terms of a conceptual scheme. Parsons again writes:

> Furthermore, it is a fairly well-recognized methodological principle of general application that data are not simply 'facts' but that, like all the facts of science, they are stated 'in terms of a conceptual scheme' (Parsons 1937, 479 [Y|Y|Y|N]).

Our qualitative analysis of the 1930s suggests that the Hendersonian notion of conceptual scheme was accepted in the sociological articles we have considered.

1940s

From the 1940s, we have identified 114 journal articles that contain the bigram 'conceptual scheme' (about 1% of the total) – this is, again, an increase of almost four times the number of articles we had found for the 1930s (normalized per number of papers published). The breakdown per journal:

The bigram 'conceptual scheme' was, again, used most often in the *American Sociological Review* and the *American Journal of Sociology*, which together published roughly half of the papers in our corpus containing the bigram (this is rather uninformative, since these two journals also published roughly half of the total number of papers for the period).

Table 10.11 Articles in which 'conceptual scheme' features by journal, 1940s.

Journal (total: 8)	Number of Articles containing 'conceptual scheme' (total: 367 | for the period: 114)
American Sociological Review	30
American Journal of Sociology	25
Social Forces	17
American Anthropologist	16
American Catholic Sociological Review	14
Psychological Review	6
Sociometry	5
Journal of Social Psychology	1

Table 10.12 Articles in which 'conceptual scheme' occurs, by author affiliation (threshold ≥ 3), 1940s.

Affiliation (threshold ≥3)	Occurrences
Harvard	18
Fordham	9
Princeton	4
Northwestern University	4
University of North Carolina	3
University of California	3
Columbia	3
Cornell University	3

Table 10.12 (*Continued*)

Affiliation (threshold ≥3)	Occurrences
Catholic University of America	3
University of Oklahoma	3
Union College	3

Table 10.13 Articles featuring 'conceptual scheme' by author (threshold ≥ 2), 1940s.

Authors (threshold (threshold ≥2)	Occurrences
Parsons, Talcott	7
Timasheff, Nicholas S.	6
Kluckhohn, Clyde	5
Davis, Arthur K.	5
Devereux, George	3
Hartnett, Robert C.	3
Whyte, William F.	3
Bain, Read	2
Moore, Wilbert E.	2
Hallowell, A. Irving	2
Kimball, Solon T.	2
Homans, George C.	2
Demerath, Nicholas J.	2

A survey of the affiliations of the authors who published articles using 'conceptual scheme' (table ~~below~~) shows that, as with the 1930s, Harvard is the most common. Eighteen articles were published by authors working at Harvard, double the number published by authors working at Fordham University (nine). Other universities appear less frequently.

To unveil the true import of the Harvard link with the notion, however, we need to dig a bit deeper. ~~Let's see first the list of authors:~~

~~On this list~~ we find authors with a Harvard formal affiliation at the time of writing. We see, for example, Parsons, who again tops the 40s chart with seven articles, and Clyde Kluckhohn,[14] third equal with five articles, as well as George C. Homans with two articles. The link between Harvard and the

[14] Kluckhohn received his PhD in anthropology at Harvard in 1936 and later became to professor in Social Anthropology at the same institution, https://en.wikipedia.org/wiki/Clyde_Kluckhohn.

bigram 'conceptual scheme', however, is far stronger when one considers, again, the invisible Harvardians in the list: Timasheff (second in the list, six papers), who came to the United States in 1936 as a visiting lecturer at Harvard University, and later became a Fordham University Professor, authored six of the nine Fordham articles[15]; Arthur K. Davis (tied third with five articles), PhD at Harvard under Parsons (1941), later moved to Union College (Nock 2002), and wrote, next to two Harvard papers, all three of the Union papers; George Devereux (fourth equal with three articles), was part of the so-called 'Parsonage', Parson's Sociological Group (Gerhardt 2016, 39, fn 150, counts Devereux among 'Parson's students'; Camic 1991, xliii fn 120 does the same; see also Hamilton 1992, 209). He authored one paper in 1940 under a Harvard affiliation, alongside two subsequent Wyoming papers. William Foote Whyte (seventh on the list), who was affiliated with the University of Oklahoma and wrote all three Oklahoma papers, had been a junior fellow at Harvard. Solon Kimball (Harvard PhD 1936), authored two papers while affiliated to Alabama and Michigan State which, being under the threshold, do not show in the table. Nicholas J. Demerath, also a Harvard graduate, wrote two of the three North Carolina papers. Hadley Cantril and Wilbert E. Moore had Harvard degrees, and, taken together, were involved in three of the four Princeton papers. This means that of the 13 top individuals in the list, 10 were Harvardians (77%). Other Harvard graduates not shown on this table (having one paper each) are: Robert K. Merton (Columbia) who was at Harvard up to 1938 and wrote one of the Columbia papers, Kingsley Davis (Penn State), Conrad M. Arensberg (Brooklyn college), Albert K. Cohen (Indiana), Charles P. Loomis (Michigan State), Muzafer Sherif (Princeton) and George H. Hildebrand (Princeton, Ehrenberg et al. 2007). From this we can safely conclude that the bigram was popular among Harvard staff and students. This is consistent with the idea that the phrase was a hallmark of Harvard sociology.

Of our 114 journal articles from the 1940s, Annotator 1 scored 72 passages as articulating the Hendersonian notion of conceptual scheme (Yes), 30 passages as maybe containing it (Maybe), and zero passages as not containing the Hendersonian notion (No). Twelve passages were left without a score because it was not possible to score them, because they contained only a reference to an article with the bigram 'conceptual scheme' in the title. Annotator 1 also noted that of the 114 journal articles, 14 contained additional philosophical information on or analysis of conceptual scheme, whereas 88 articles merely

[15] https://www.nytimes.com/1970/03/10/archives/dr-nicholas-timasheff-dies-sociologist-on-fordham-faculty.html.

used the notion without providing additional information or analysis. Again, 12 articles were not scored in this manner because providing a score was not possible. Annotator 2 scored 66 passages as articulating the Hendersonian notion of conceptual scheme (Yes), 36 passages as maybe containing it (Maybe), and zero passages as not containing the Hendersonian notion (No). For the same reasons as Annotator 1, 12 passages were left unscored. In addition, Annotator 2 thought that 14 out of the 114 articles contained additional information on the notion of conceptual scheme, 88 contained no such information and 12 were left unscored. The interrater reliability (Cohen's kappa) on whether the articles contained the Hendersonian notion was kappa = 0.9025641026. The interrater reliability on whether the articles contained additional philosophical information on the notion of conceptual scheme was kappa = 0.9535830619. These results again indicate that whenever the bigram 'conceptual scheme' was used, it was to express the Hendersonian notion (or maybe so), as no single use of the phrase was not *possibly* Hendersonian. In addition, Annotator 1 scored 58 out of 72 articles using the Hendersonian notion of conceptual scheme as not containing any additional information on this notion (81%). Annotator 2 scored 52 out of 66 articles in this way (79%). Given this high score on the lack of additional information, we may presume that the notion was (at least considered as) well understood and perhaps accepted as a matter of course. In short: that 'conceptual scheme' belonged to a set of standard terms in at least some quarters of US sociology in the 1940s.

Let's again turn to a tentative qualitative analysis of the notion of conceptual scheme as it was used in 1940s sociology. The analysis provides results that are comparable to our analysis of the 1930s. First, we may note that, in line with condition (2) of our model, conceptual schemes were conceived of as 'systems' of concepts that are 'integrated' as one would expect a framework to be, and on the basis of which we analyse empirical phenomena. As Talcott Parsons writes:

> A generalized social system is a conceptual scheme, not an empirical phenomenon. It is a logically integrated system of generalized concepts of empirical reference in terms of which an indefinite number of concretely differing empirical systems can be described and analyzed (see L.J. Henderson, *Pareto's General Sociology,* Cambridge: Harvard University Press, 1935, chap. iv and n.3) (Parsons 1940, 844 [Y|Y|Y|Y]).

In a quite similar fashion, the anthropologist Conrad Arensberg describes conceptual schemes as frameworks that allow one to organize *observations*

(Arensberg 1941 [Y|Y|N|N]); similarly, Timasheff notes that although science is based on observation, observation conducive to scientific knowledge requires more than perceptions: in addition to sense perceptions, 'there must be a conceptual scheme in terms of which the observations are formulated.' (Timasheff 1947, 201 [Y|Y|Y|Y]).

Timasheff further notes that conceptual schemes often consist of (systems of) *definitions* (Timasheff 1947, 202), which serve the following function: they are tools of scientific analysis by allowing identification of objects and they are tools for the communication and preservation of knowledge (Timasheff 1947, 201). Mature sciences, such as economics, have, according to Timasheff, a conceptual scheme consisting of systems of definitions in which basic concepts, such as *price, supply, demand*, etc., are 'almost as well systematized as the concepts of the natural sciences.' (Timasheff 1947, 202). Hence, a conceptual framework of definitions in which terms are defined in terms of a set of basic concepts seems to be a good example of a conceptual scheme.

The idea that conceptual schemes are frameworks of concepts or definitions used for interpreting *observations* and *phenomena* fits condition (2) of our Hendersonian model of the idea of conceptual scheme. Furthermore, in line with this condition, some authors in the 1940s also clearly take *facts* to be empirical statements in terms of a conceptual scheme. Thus, for example, the sociologist Gwynne Nettler, in an article in the *American Sociological Review*, quotes Henderson when he says that a fact is 'an empirically verifiable statement about phenomena in terms of a conceptual scheme' (Nettler 1946, 180 [Y|Y|Y|Y]).

Finally, condition (1) of our Hendersonian model of the idea of a conceptual scheme is that sciences *must have* a conceptual scheme. In other words, having a conceptual scheme is normatively prescribed to sciences in order to be a proper science. As an example of this view in the 1940s, one might consider this passage from Warner E. Gettys, who, writing about the science of human ecology, notes that human ecology must be based on an ecological conceptual scheme if it is to be counted as a science:

> If 'human' ecology […] will concentrate on the study of the distributive aspects of human beings and their institutions by methods suited to such material and then analyze and interpret its data in terms of its ecological conceptual scheme, it may well make a place for itself among the social sciences and beyond the criticism of its friends and the mockery of its detractors. (Gettys 1940, 474 [Y|Y|N|N])

1950s

In the 1950s, 226 journal articles from our corpus included the bigram 'conceptual scheme' (slightly less than 2% of the total). This represents a normalized increase of about one and half times the number of occurrences in the 1940s, which shows that the bigram increased in popularity. The occurrences of the bigram within the journals of our corpus are displayed in ~~the~~ table ~~below:~~

The affiliations of authors who published articles containing the bigram above a certain threshold shows a larger spread than in the 1940s. From 11 affiliations in the 1940s (with a threshold of ≥ three articles) the total for the 1950s, adopting the same threshold, increased to 23 affiliations. Moreover, the highest-ranked institution by number of published papers using 'conceptual scheme' is now Chicago. We take these data to indicate a spread of the notion of conceptual scheme. A caveat, however: the increase in the range of affiliations could be due to an increase in the number of sociology departments from the 1940s to the 1950s, while the change in the top ranking institution could be due to a change in departmental situations (increase or decrease in hiring, mergers, etc). Should hard data on these factors become available, our numbers should be normalized against them.[16] ~~The next table~~ shows the spread of affiliations in our corpus.

Table 10.14 Articles featuring 'conceptual scheme' by journal, 1950s.

Journal (total: 8)	**Number of Articles containing 'conceptual scheme' (total: 367 | total for the period: 226)**
American Sociological Review	67
Social Forces	46
American Anthropologist	33
American Journal of Sociology	30
American Catholic Sociological Review	27
Psychological Review	9
Sociometry	9
Journal of Social Psychology	5

[16] We do know there is an increase in papers published, namely 12,224 in the 1950s vs 9,728 in the 1940s, and though we do not have data on the affiliation of the authors of all these papers, we calculated that the number of unique, non-Harvard affiliations present in our corpus increases when normalized against the total numbers of papers published, and decreases (though far less than in the

Table 10.15 Articles in which 'conceptual scheme' is used by author affiliation (threshold ≥ 3), 1950s.

Affiliation (threshold ≥ 3)	Occurrences
University of Chicago	14
Harvard	11
University of Michigan	9
University of Wisconsin	7
Michigan state	6
Ohio State	6
Fordham	5
Indiana University	5
University of Colorado	5
Rutgers	5
University of Minnesota	5
University of Washington	4
Marquette University	4
Princeton	3
University of California	3
Columbia	3
Pennsylvania State College	3
Smith College	3
Wayne University	3
Brown University	3
Oberlin College	3
Louisiana State University	3
Berkeley	3

We take as further evidence for the spread of the *notion* of conceptual scheme the fact that the number of scientists who use the *bigram* 'conceptual scheme' in the 1950s in two or more articles (30 authors) is more than double the corresponding number in the 1940s (13 authors). We should also consider that the number of Harvard-affiliated papers in the 1950s decreases with respect to

1950s than before, and has a sharp downward trend, thus showing growing variety) if normalized against the number of 'conceptual scheme' papers. The latter finding is consistent with the fact that some institutions other than Harvard start publishing a higher number of papers per institution (ex. Chicago in the Fifties): and indeed, the *ratio* of the number of non-Harvard authored papers to unique non-Harvard institutions grows through the decades.

the 1940s, while the number of papers containing 'conceptual scheme' published in the 1950s is almost twice the number of papers published in the 1940s (normalized growth: more than one and half times).

As per ~~the next~~ table, the author who used the bigram 'conceptual scheme' most in the 1950s is the social scientist Rudolph E. Morris, (Marquette University), who uses it in four published articles within our 1950s corpus. Timasheff follows as the second highest ranked author for the second consecutive decade, with three papers. Anselm L. Strauss, of the University of Chicago, Matilda White Riley, a research assistant at Harvard in the 1930s and later professor at Rutgers, Chester A. Jurczak, a social scientist affiliated with Duquesne University, and Roland J. Pellegrin, a social scientist affiliated with Louisiana State university, all use the bigram in three papers, viz:

Table 10.16 Articles using bigram 'conceptual scheme' by author (threshold ≥ 2), 1950s.

Author (threshold ≥ 2)	Occurrences
Morris, Rudolph E.	4
Timasheff, Nicholas S.	3
Strauss, Anselm L.	3
Riley, Matilda W.	3
Jurczak, Chester A.	3
Pellegrin, Roland J.	3
Parsons, Talcott	2
Seeman, Melvin	2
Moore, Wilbert E.	2
Loomis, Charles P.	2
Brewer, Earl D. C.	2
Moreno, Jacob L.	2
Lindesmith, Alfred R.	2
Pfautz, Harold W.	2
Duncan, Otis D.	2
Jonassen, Christen T.	2
Hart, Charles W. M.	2
Simpson, George E.	2
Abel, Theodore	2
Fallers, Lloyd A.	2

Table 10.16 (*Continued*)

Author (threshold ≥ 2)	Occurrences
Theodorson, George A.	2
Alpert, Harry	2
Wilkening, Eugene A.	2
Form, William H.	2
Schuyler, Joseph B.	2
Wax, Murray	2
Schnore, Leo F.	2
Etzioni, Amitai	2
Spuhler, J. N.	2
Taylor, Walter W.	2

As before, we looked at the so-called 'invisible Harvardians'. In the 1950s, the invisible Harvardians include Timasheff, who authored three of the Fordham papers, Matilda White Riley, who authored three of the Rutgers papers, Charles P. Loomis, who published two papers containing the notion while at Michigan State, Wilbert E. Moore (two articles while at Princeton) Bernhard Barber with one article at Smith College (not on table), Muzafer Sherif, one article at the University of Oklahoma (not on table), and Hiroshi Daifuku, one article at the University of Wisconsin (not on table). The only author with an active Harvard affiliation on our list is Talcott Parsons. Thus, in the 1950s, of the 30 individuals on our list, five are Harvardians or invisible Harvardians – about 16.5%. In the 1940s, they were 77%. Hence, although there are invisible Harvardians in the 1950s, these are far lower in (normalized) percentage than in the 1940s, and our talk of a spread of the notion of conceptual scheme from Harvard to other universities seems justified – although note that our use of a threshold and possible lack of data on the total number of invisible Harvardians in the period at issue might affect this reasoning.[17]

We once again investigated the extent to which the Hendersonian notion of conceptual scheme was employed. Out of our 226 journal articles for the

[17] So the number of invisible Harvardians did not grow from 1940s to 1950s (at least if we consider the authors above a certain threshold): what if it had grown? Would this datum be in conflict with (at least one take on) the hypothesis that the notion 'spread' to other Universities'? For it might be contentious to say that a notion 'spread to other Universities,' if all that is going on is that ex-Harvardians moved to other Universities and took a Harvard hallmark expression with them. We say that it is legitimate to talk of *spread* in this case (while we might talk of 'influence' in case that authors with no demonstrable Harvard history would use the notion more and more).

1950s, Annotator 1 scored 146 passages as containing the Hendersonian notion of conceptual scheme (Yes), 69 passages as maybe containing it (Maybe), and zero passages as not containing it (No). Eleven passages could not be scored. In addition, Annotator 1 thought that 9 out of the 226 articles contained additional theoretical or philosophical information on the notion of conceptual scheme, whereas 206 articles used the term without providing additional theoretical information. Again, 11 articles could not be scored. Annotator 2 scored 133 passages as containing the Hendersonian notion of conceptual scheme (Yes), 82 passages as maybe containing it (Maybe), and zero passages as not containing it (No). Eleven passages could not be scored. Annotator 2 noted that 8 out of the 226 articles offered additional philosophical information on the notion of conceptual scheme, 207 did not provide additional information and 11 were unscored. The interrater reliability (Cohen's kappa) on whether the articles contained the Hendersonian notion of conceptual scheme was kappa = 0.8864716566. The interrater reliability on whether the articles contained extra info was kappa = 0.9725761437. Annotator 1 scored 137 out of 146 articles using the Hendersonian notion of conceptual scheme as not containing any additional information or explanation on this notion. Annotator 2 scored 125 out of 133 articles containing the Hendersonian notion of conceptual scheme in the same way. The fact that about 94% (Annotator 1 and Annotator 2) of the authors who used the Hendersonian notion of conceptual scheme simply applied this notion without providing additional explanation suggests that in the 1950s, the idea is well-entrenched in (at least part of) US sociology. Again, in all cases in which the bigram was used, it was (possibly at least) used in the Hendersonian sense.

If we look at the occurrences of the phrase 'conceptual scheme' in our corpus from a qualitative perspective, we find much that is familiar from earlier decades. Thus, in line with condition (2) of our Hendersonian model, a conceptual scheme is often understood as part of a theoretical framework of a science in terms of which facts, data or phenomena are interpreted. For example, Alvin Boskoff writes:

> Scientific theory, then, is composed of generalized conceptual schemes which are ultimately confronted for verification by facts. But while sound theory must fit the facts, it does not follow that 'the facts' determine what the theory is to be. 'Fact' is always guided by a theoretical scheme, even if it is implicit, which formulates what we know and tells us what we want to know. (Boskoff 1950: 393 [Y|Y|Y|Y]).

A new topic that was much discussed in the 1950's was Robert Merton's critique of Talcott Parsons' paper '*The Position of Sociological Theory*' (1948). In his comments to this paper, as well as in other works, Merton criticized sociological

works that were derived from a single, all-inclusive master conceptual scheme. Rather than finding a single conceptual scheme for the whole of sociology from which uniformities of social behaviour can be derived, Merton argued that sociology should articulate multiple special theories for limited data. As he puts it himself:

> I believe that our major task *today* is to develop special theories applicable to limited ranges of data—theories, for example, of class dynamics, of conflicting group pressures, of the flow of power and interpersonal influence in communities—rather than to seek here and now the 'single' conceptual structure adequate to derive all these and other theories. (Merton 1948, 166)

(This passage was not scored because it did not contain the phrase 'conceptual scheme'. Parson's paper, on which Merton commented, was scored [Y|Y|Y|Y]).

Merton's critique of the idea of an all-inclusive conceptual scheme for sociology was often discussed in the 1950s (see, for example, Boskoff 1950 [Y|Y|Y|Y]; Kilzer 1950 [Y|Y|Y|Y]; Bain 1950 [Y|Y|N|N]; Vance 1952 [Y|Y|N|N]; Nett 1952 [Y|Y|N|N]). Note the use of 'derive' in 'derive all these […] theories' which suggests a specification of the Hendersonian model similar to that of Timasheff (1947) as seen above.

Apart from Merton's critique of grand theorizing in sociology, the phrase 'conceptual scheme' is used in the 1950s in a manner that suggests that conceptual schemes are similar to *theories*. Thus, for example, theories developed by Marx and Engels are described as conceptual schemes (Jonassen 1951 [Y|Y|N|N]). The core meaning in these uses of conceptual scheme seems to be simply that of a theoretical framework of a science (see, e.g. Luchins 1951 [Y|Y|N|N]).

The spread of the notion of conceptual scheme: preliminary findings and strengths and limitations of the method

On the basis of our analysis of the use of the phrase 'conceptual scheme' from 1888 to 1959 in our journal corpus, we conclude the following.

First, all cases of use of the bigram, even those from 1888 to 1929, are at least *possibly* Hendersonian, that is, they conform or possibly conform to a conception of conceptual scheme according to which (1) a (proper) science has a conceptual scheme; (2) a conceptual scheme is a/the (or a part of the) theoretical framework of a (proper) science in terms of which empirical phenomena, facts or data are

interpreted.[18] We witness a sensible growth in the use of the phrase through time: the articles containing the bigram found in 1888–1929 count for 0.03% of the total number of papers published in that period by the eight journals in our corpus, and for 1.85% of the total in 1950–1959. In 1930–1939, Harvard emerges from the data as the locus of the (Hendersonian) notion of conceptual scheme, as in this period half of the papers containing the bigram are authored by Harvard-affiliated individuals; afterwards, this percentage decreases to about 16% (1940–1949), and 5% (1950–1959): in the final period Chicago takes over as the top-ranked institution for papers containing the bigram 'conceptual scheme'.[19] Thus, we submit, the notion spread from Harvard to other institutions: the number of (non-unique) affiliations other than Harvard indicated in authored papers containing the bigram increases in each decade (by about 21% in the 1940s with respect to the 1930s, and a further 12% in the 1950s with respect to the 1940s). In particular, in the 1950s the number of unique authors who use the bigram 'conceptual scheme' in two or more papers (30) is more than double that of the 1940s (13 authors), while the number of papers published in the 1950s is less than double the number published in the 1940s. Meanwhile, the Harvard share decreases sharply. We venture the hypothesis that the Hendersonian notion of conceptual scheme was a hallmark of Harvard sociology in the thirties, and that it spread to other institutions over the course of three decades.

Second, given the strict association between the bigram and its Hendersonian meaning our research so far seems to lend some plausibility to the hypothesis that Quine had the notion of conceptual scheme from Henderson. This seems to be the case at least as far as the expression 'conceptual scheme' is concerned, and under a rather liberal interpretation of what can be considered 'part of (a) framework' in the Hendersonian model. This would mean that at least part of the 1981 quote from Quine mentioned in Section 'Method and corpora' is trustworthy ('I inherited it some forty-five years ago through L. J. Henderson'). Considering the last part ('from Pareto'), whether there were sources other than Henderson, or whether Henderson himself inherited the notion, together with

[18] For the breakdown: *Does the phrase 'conceptual scheme' express the Hendersonian notion as fixed by the model?* < 1930s: Annotator 1 Yes 33% Maybe 67% | Annotator 2 Yes 33% Maybe 67%; 1930s: A1 Yes 75% Maybe 29% | A2 Yes 71% Maybe 25%; 1940s: A1 Y 63% M 26%| A2 Y 58% M 32%; 1950s: A1 Y 65% M 31% | A2 Y 59% M 36%. *Does the article contain additional information on the notion of conceptual scheme?* < 1930s, A1 Y 0% N 100% | A2 Y 0% N 100%; 1930s; A1 Y 17% N 79% | A2 Y 13% N 83%; 1940s: A1 Y 12% N 77% | A2 Y 12% N 77%; 1950s: A1 Y 4% N 91% |A2 Y 4% N 92%.

[19] If we take into account the 'invisible Harvardians', the percentages are higher, but we still see a significant decrease: 54% in the 1930s; 39% in the 1940s; 8% in the 1950s. Note, however, that as we say in footnote 11, biographical details might be difficult to ascertain for every author, so these percentages might not be fully correct.

the bigram, from Pareto or from someone else is a matter for further research. It is, however, interesting to note in this connection that we took the main *locus* of the phrase and source of our model to be Henderson 1932, but we have found uses of the bigram in the Hendersonian sense as early as 1905 (A1: M; A2: M) or at least 1916 (A1: Y; A2: Y). Moreover, Henderson himself is curiously absent from our list of authors, although other authors do refer to his work in connection with the bigram.

This brings us directly to strengths and limitations of our method. Traditional research on the origin, development and spread of ideas or concepts, such as the idea of a conceptual scheme, relies on a small, selected number of sources. In this chapter, we have presented research that relies on a large corpus (large compared to traditional studies in the history of philosophy) which serves as a broad quantitative basis on which hypotheses concerning the origin, development and spread of an idea such as conceptual scheme can be properly supported.

By constructing a large dataset of journal articles and interpreting these on the basis of our Hendersonian model of conceptual scheme, we were able to perform a quantitative analysis of the way in which the bigram 'conceptual scheme' was used in our corpus. The quantitative analysis in question allowed us, among other things, to establish the frequency with which the bigram was used, to identify the journals with the most occurrences of the bigram, to determine the authors who used the bigram the most, and to determine their affiliations. This information is important to study the disciplinary origin of the bigram and the dissemination of the bigram within different disciplines.

Having described the strengths of our method we may now turn to its limitations. The digital corpus we use in this chapter, though unusually large if compared with the number of sources used in traditional research in the history of philosophy, is still quite limited. Ideally, the corpus to answer any research question on the history of any idea in any period would be *universal*: it would consist of the high-quality, digital version of every single text produced in the period at issue – or at least of every single *published* text. A universal ideal corpus such as this is far beyond the practical reality of any corpus that can be obtained in a sensible amount of time by any known means. The biggest challenge, and the most time-consuming part of any research in the computational history of philosophy is building a suitable digital corpus (Betti, Reynaert, and van den Berg 2017). In short, building a universal digital corpus of the size needed to answer the question at issue properly is, at present, a quixotic endeavour. For this reason, we initially designed the research based on a restricted corpus composed by a combination of *two* datasets: articles from journals arguably representative

for the disciplines of sociology and psychology in US in the period at issue (*Dataset 1*, the one we use in this pilot) and the complete *oeuvres* of each of the individual authors known to have contributed to the traditional hypotheses (James, Henderson, Pareto, Piaget, etc) (*Dataset 2*, which we are yet to build). From a scholarly point of view, such a combined corpus strikes us as a good methodological compromise to tackle our research question given the practical constraints. The construction of even this restricted corpus, however, poses hard challenges. We plan to extend Dataset 1 with additional psychology and philosophy journals. Then we will construct Dataset 2 and run a study on its basis. The ultimate aim will be to combine the two datasets.

As a first next step we plan to enlarge Dataset 1 with the *American Journal of Psychology, Open Court, Pedagogical Seminary* and two major philosophy journals, *Mind* and *The Journal of Philosophy*.

Another limitation of the method we employ is that the corpus we have built is made up of pdf files. This means that we cannot perform sophisticated computational analyses on the corpus, but have had to restrict ourselves to very basic searches, restricted by the quality of the textual layer OCR provided by the publisher. This means, for example, that although the visual appearance of the pdf might have contained the string 'conceptual scheme' three times for a human reader, our search results might have yielded only one (or even zero), because the OCR of the textual layer might have 'misread' the remaining two occurrences as, say, 'conceptual sche me'. Such OCR errors can render occurrences of the target phrase invisible to a computer search (see the case of 'dis organization 10/ disorgani zation 8' that we mention in Section ~~2.1~~).

For more sophisticated analyses we would need to have the corpus transformed into a more reliably machine-processed format (plain text or.txt, or, ideally, TEI).[20] A high-quality corpus in.txt (if not in basic TEI) is a necessary requisite for sophisticated computational analysis in the history of philosophical ideas, where we need access to an (in principle) indefinitely extendable number of books and journals that contain a concept of scholarly interest (Betti, Reynaert, and van den Berg 2017). At the moment however, turning a 42,000-pdf corpus into a high-quality corpus in.txt format would be a laborious effort exceeding our purpose. Right now, we are more interested in quick adaptation and/or growth of the corpus: as said, our corpus of more than 42,000 articles is still very limited for the kind of research question we want to tackle. However, as we have

[20] For a nice example of effectively using TEI as a research tool on a philosophical text, see http://digitallockeproject.nl/. Note however that the TEI was created/transcribed manually.

shown, when restricted to simple searches (such as that for the string 'conceptual scheme') plus a qualitative-quantitative manual analysis of the kind examined in this chapter, working with pdfs on a simple textual interface might be the best short-term strategy. Soon however, we would want to search for the *concept* of conceptual scheme, even when the bigram is not used. For this, we would need a high-quality textual corpus in a more machine-friendly format.

A further limitation of the method is that it does not allow for in-depth qualitative analysis as traditionally performed in the history of philosophy. To conduct such an analysis on a corpus as large as that used constructed for the research in this chapter, would mean researching in depth the views of all of the authors identified in the dataset – hardly feasible. We address this by adopting the *model approach* to the history of ideas, which allows for qualitative analysis of large bodies of text.

The choice of non-homogenous periodization (sometimes a decade, sometimes a longer period) presents a further limitation, because of possible distortions of the analyses arising from the particular periodization chosen.

Note, however, that our quantitative analysis proceeded on the basis of a qualitative interpretative framework, that is, the Hendersonian model of the idea of conceptual scheme. Hence, our analysis of the data is not theory-free but rather theory-laden. It is our belief that scholars in the history of philosophy, and more broadly the humanities, can only adequately analyse large quantities of data on the basis of such qualitative interpretative frameworks or models (see Betti and van den Berg 2016, 2014). Our experience of the research for this chapter confirmed this fact. Initially, we collected our dataset of journal articles and tried to make sense of the many occurrences of the bigram 'conceptual scheme' without a theoretical model. However, we soon discovered that we could not make sense of the large quantity of data bottom-up. Only after we introduced the Hendersonian model of a conceptual scheme could we adequately interpret the volume of journal articles that we needed to study. The Hendersonian model made the interpretation of a large corpus of texts possible. One would have to acknowledge, however, that our model was rudimentary and that for a more sophisticated analysis a better, more articulated model is needed, one that would allow us to be more discriminating as to what fits and what does not fit, and afforded fine-grained analyses and distinctions. The current working model of conceptual scheme should be considered a prototype. We plan to improve on it in the future.

That said, we have found no convincing evidence for the existence of a competing notion of conceptual scheme: that is neither annotator found even

a single passage in which the bigram is not possibly (at least) expressing the Hendersonian notion. The fact that the we have found no discussion of alternative conceptions (i.e. we have no combination 'there is no Hendersonian notion' and 'there is further information on the notion'), can be taken to be evidence that, at least in the corpus we considered, no such alternative conception appears. We cannot exclude that the model we built is too general – that it captures too much. If this is the case, then the annotators' *Maybes* might be reconsidered: some of them might turn into 'Yes' or 'No' should an annotator be asked to base evaluation on different variants of the Hendersonian model, or to choose between two competing models. Nevertheless, there is nothing necessarily puzzling in the results we describe.

The insight that models are needed to interpret texts is not new, although there is still little awareness of it in traditional research in the history of ideas. It has long been established by cognitive psychologists who have developed the so-called schema theory of knowledge (Betti and van den Berg 2014; Betti 2014) According to these psychologists (see, e.g. Anderson 1977; Rumelhart 1980), readers need interpretative schemas to interpret texts, and without schemata understanding is impossible (see also Chapter 2 in this volume). As Anderson remarks in a discussion of reading comprehension: 'text is gobbledygook unless the reader possesses an interpretative framework to breathe meaning into it' (Anderson 1977, 423). This view was once again confirmed when we did the research for this article.

Conclusion

Traditional research has provided conflicting qualitative hypotheses on the origin of the notion of conceptual scheme. These hypotheses are based on selective reading of small corpora. In this chapter we provided a new, mixed method for studying the spread of this notion, in principle generalizable to any notion, concept or idea whatsoever. Using our *model approach* to the history of ideas, we provided a qualitatively informed quantitative analysis of the spread of the use of the bigram 'conceptual scheme' in about 42,000 journal articles in the social sciences and psychology from 1888 to 1959. We argued that having such a corpus, large relative to traditional qualitative studies in history of philosophy, is necessary to provide adequate evidence for hypotheses concerning the origin, development and spread of an idea. Our analysis provides some alternative support for the hypothesis that Quine adopted the notion of conceptual scheme

following Lawrence J. Henderson (1878–1942), although at this stage we cannot exclude multiple influences or a common ancestor for its origin.

Suggested Readings

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