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SCIENCE AND SCIENTIFIC DISCIPLINES IN *TIME MAGAZINE*: A CORPUS STUDY

ABSTRACT

The study of human scientific activity is a well-established field of historical investigation. There are numerous publications devoted to the history of science both in the formats of research papers, monographs and encyclopaedias. The present study aims at testing the validity and relevance of computer text analysis for the purpose of making a contribution to these scholarly studies. The content of the phraseological discussion included here is based on several diachronic corpora of American English with special attention paid to the *Time Magazine Corpus*. This corpus contains all the articles published in *Time Magazine* in the years 1923–2006 which are available via integrated online software from the *English Corpora* platform. The lexical analysis identifies collocational patterns of the term *science* where *science* is the main collocator whereas attributive adjectives define the scope of reference of the term under discussion. Nominal compounds are also considered. Additionally, this study traces cultural diachronic distribution and frequency trends of both the term *science* and its phraseological developments with special focus on the names of various sciences accounted for in *Time Magazine*.

KEYWORDS: science, terminology, adjective, Time Magazine, corpus

STRESZCZENIE

Opis aktywności naukowej człowieka jest integralną częścią badań historycznych. Prace z zakresu historii nauki publikowane są w formie artykułów naukowych, opracowań monograficznych i obszernych wydawnictw encyklopedycznych. Niniejszy artykuł ma na celu sprawdzenie użyteczności i potencjału badawczego jaki posiada metodologia komputerowej analizy tekstu w badaniach naukowych poświęconych historii nauki. Przedmiotem badania jest materiał diachroniczny zawarty w kilku korpusach językowych amerykańskiej odmiany języka angielskiego. Szczególną uwagę poświęcono *Time Magazine Corpus*, którego baza tekstowa udostępniona na platformie *English Corpora* składa się z artykułów opublikowanych w magazynie *Time* w latach 1923–2006. W analizie leksykalnej niniejszego opracowania zebrano i sklasyfikowano kolokacje przymiotnikowe terminu *science*, co pozwoliło na określenie zakresów znaczeniowych opisywanego terminu. Ponadto przebadano złożenia rzeczownikowe pod kątem atrybucji semantycznej. Przedmiotem badania była również dystrybucja diachroniczna i trendy częstotliwościowe terminu *science* i jego związków frazeologicznych. Umożliwiło to określenie motywacji kulturowej opisywanych zjawisk leksykalnych ze szczególnym uwzględnieniem nazw tych dyscyplin naukowych, które najczęściej występują w artykułach publikowanych na łamach magazynu *Time*.

SŁOWA KLUCZOWE: science, terminologia, przymiotnik, Time Magazine, korpus

INTRODUCTION

Observations of the natural world phenomena have always perplexed and compelled the human observer to seek justification and rational explanation. Throughout history, wise men, magi and philosophers have pondered at the underlying forces that lie beneath the perceived reality of both the animate and inanimate nature. The origins of the rationalisations of the natural world and the creation of protoscience can be seen in astronomy and the development of mathematics in ancient China, India, Central America, Mesopotamia, Egypt (cf. Selin 2013) and notably the city states of Greece (Lloyd 1970). This intellectual activity found across time, space and cultures has prompted historians of science to account for the various aspects of scientific discovery. The most recent of such studies include *The evolution of knowledge: Rethinking science for the Anthropocene* by Jürgen Renn (2020), *Expanding Horizons in the History of Science: The Comparative Approach* by Geoffrey Lloyd (2021) and *The origins of modern science: From antiquity to the scientific revolution* by Ofer Gal (2021). For a comprehensive overview of the history of science see *The Cambridge history of science* published in eight volumes in the years 2002–2020.

The focus of this paper is to trace the lexical properties of the term *science* in the English language. Special interest of the study is placed on the various scientific disciplines which were referred to in the US journalistic discourse represented by *Time Magazine*. From a linguistic point of view, the concept of SCIENCE has been lexicalized in English in a number of forms which profile certain semantic properties of ‘the state of knowing’. In the entry on Knowledge (02.01.12), the *Historical Thesaurus of English* records the following terms for the Old English period *ingewitnes*, *oncnaw(en)nes*, *ongietenes* as well as *andgit* and *i-witnes* which remained in use until Early Middle English. Of the terms conceptualizing KNOWING which entered the English lexicon after 1150 only the terms *knowing* (a1300–), *science* (a1340–), *knowledge* (1387–) and *comprehension* (1597–) are still used in contemporary English. The other terms recorded in HTE became obsolete or were even attested in ephemeral, one-occurrence use. These include *knowledging* (a1225–1560), *cunningship* a1300, *witting* a1300–1621, after 1808 in dialectal use), *beknowing* (1340), *beknning* (c1380), *meaning* (1393), *feel* (a1399–1662), *wit* (a1400–1483), *congizance/-sance* (c1400–1651), *kenning* c1400–c1440 + after 1800 in dialectal use), *understand* (1444), *cognition* (1447–1796), *recognizance* (c1450), *recognition* (1526 + 1547), *cognoscence* (1536 in dialectal use), *conscience* (1563/87), *comprehense* (1604), *cognizant/-isant* (1634), *sciency* (1642) and *knowledgement* (1650 + 1889).

Only the term *science* out of the 29 items in this lexical field specialized to denote, as *Encyclopædia Britannica* defines it, “any system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truths or the operations of fundamental laws”. This ultimate technical definition of *science* is, however, a conglomerate of a number of

subsenses of the term. This complex composition of the semantics of *science* can be seen in meanings listed under 4 and 5 as recorded in the *Oxford English Dictionary* (*OED*). This dictionary distinguishes several historically viable meanings which fell out of use. These include (the definitions below follow the *OED* numbering):

- 1a. The state or fact of knowing; knowledge or cognizance of something; knowledge as a personal attribute. Now archaic and rare.
- 1b. Theoretical or intellectual understanding, as distinct from moral conviction. Paired or contrasted with conscience. Obsolete.
- 2. Knowledge or understanding acquired by study; acquaintance with or mastery of any branch of learning. Also in plural: (a person's) various kinds of knowledge. Obsolete.
- 3a. A particular area of knowledge or study; a recognized branch of learning; spec. (in the Middle Ages) each of the seven subjects forming the trivium (grammar, logic, and rhetoric) and quadrivium (arithmetic, geometry, music, and astronomy). Now archaic.
- 3b. In extended use, denoting a game, sport, or other activity conceived as being similarly organized. Frequently somewhat humorous. Now rare.

For contemporary English the *OED* lists the following:

- 4a. Paired or contrasted with art. A discipline, field of study, or activity concerned with theory rather than method, or requiring the knowledge and systematic application of principles, rather than relying on traditional rules, acquired skill, or intuition.
- 4b. A branch of study that deals with a connected body of demonstrated truths or with observed facts systematically classified and more or less comprehended by general laws, and incorporating trustworthy methods (now esp. those involving the scientific method and which incorporate falsifiable hypotheses) for the discovery of new truth in its own domain.
- 4c. With of. Denoting the application of scientific methods in a field of study, activity, etc., previously considered open only to theories based on subjective, historical, or undemonstrable abstract criteria.
- 5a. The kind of organized knowledge or intellectual activity of which the various branches of learning are examples. In early use, with reference to sense 3a: what is taught in universities or may be learned by study. In later use: scientific disciplines considered collectively, as distinguished from other departments of learning; scientific doctrine or investigation; the collective understanding of scientists.
- 5b. The intellectual and practical activity encompassing those branches of study that relate to the phenomena of the physical universe and their laws, sometimes with implied exclusion of pure mathematics.

5c. With *the*. The scientific principles or processes which govern or underpin a (specified) phenomenon, technology, etc. Also: the scientific research into these principles or processes.

5d. Scientific results obtained from observations, experiments, etc.; scientific data.

Additionally, the OED lists metaphorical extensions of the semantic scope of *science* such as various personifications and skills or professions with special references to the sport of boxing. The term *science* has also a localised use as a name for philosophy in Literae Humaniores at Oxford University and an abbreviated form for the religious movement of Christian Science in the US. This detailed listing of all the recorded senses of *science* is mirrored, with various levels of semantic nuance, in general dictionaries of American English such as *American Heritage Dictionary of the English Language*, *Merriam-Webster Online* and *Lexico*.

AIMS OF THE STUDY

There are three lexical and methodological issues which the present analysis strives to address. First, the diachronic and synchronic distribution of the term *science* is delineated in selected American English textual databases. Special attention is given to the occurrence and the frequencies of the use of the term *science* in the *Time Magazine Corpus*. This particular corpus is selected for closer analysis as the genre of the articles published in *Time Magazine* falls outside the register of scientific discourse. Secondly, it can be revealing to observe what scientific issues and topics, as expressed with the different names of scientific disciplines, are included in a general interest publication for discussion and reporting. This may also offer insight into the popularization of science and the circulation of scientific information among the readers of *Time*. And finally from a phraseological point of view, the present study offers a description of the collocational patterns of the term *science* and its nominal compounds. The main focus is placed on the attributes preceding the term *science*. It is hoped that the result allows a classification of the various types of scientific activity as expressed by the attributes associated with science.

METHODOLOGY AND DATA

The selection of *Time Magazine* for this cultural and lexical analysis was motivated by the fact that *Time* can be considered to offer a representative account of the American societal issues. This claim is verified with the frequency trends retrieved for the *Time Magazine Corpus* and other balanced and genre-specific corpora. As noted in *Encyclopaedia Britannica*'s entry on the magazine "Time was

the creation of two young journalists, Henry R. Luce and Briton Hadden, who wanted to start a magazine that would inform busy readers in a systematic, concise, and well-organized manner about current events in the United States and the rest of the world". Shortly after its establishment in 1923, *Time*'s journalism and opinion was felt across the United States. As observed in Brinkley (2010: 137–138),

With exception of the national wire services, whose stories were filtered through local newspaper editors with their own interests and tastes, *Time* – which even in its early, frail years had subscribers in every state – was for a while the only genuinely national news organ. [...] Even with its modest circulation in the 1920s, *Time* established itself as an important force in journalism if for no other reason than that it reached men and women in all parts of the country and promised to rescue them from isolation and provincialism and prepare them for the cosmopolitan world.

With the coming decades *Time* grew in its status and influence and, perhaps, can be considered a reliably accurate mirror of American culture and both domestic and international interests of its readership. The magazine became itself an object of study for historians of journalism. This, among others, can be exemplified with the monograph by Angeletti and Oliva (2017) *Time: The illustrated history of the world's most influential magazine* and the comprehensive encyclopaedic articles included in the *Encyclopedia of American Journalism* (Vaughn 2008). See also Sterling (2009), Vos and Hanusch (2019) and Örnebring (2020).

The present study investigates the articles published in *Time* in the years 1923–2006 which are available from the *Time Magazine Corpus*. This collection contains about 275 000 digitalized articles and it is part of the *English Corpora* created by Prof. Mark Davis.

Two types of search queries were used for retrieving the attributes of *science*. The query "ADJ science" yielded a total of 527 types (3,134 tokens) of the term *science* preceded by adjectives while the query "NOUN science" yielded 194 types (618 tokens) of nominal compounds where *science* constituted the head of each compound unit. There is a minimum of the frequency set for these two types of phrases.

A closer look at the sentence context the adjectival collocations revealed that in a substantial number of the cases the term *science* was part of an attribute phrase itself as it occurred in longer nominal phrases. For instance, the collocation *political science* has the largest number of tokens with 504 occurrences of which 159 belong to 29 types of phrases where *political science* constitutes an attribute of *professor* (61 tokens), *association* (18), *department* (12), *major* (12) and *group* (8) to quote the five most frequent collocators. See the illustrative contexts in (1–5).

- (1) "There is Chelsea standing on a chair singing Angels We Have Heard on High at the top of her voice, and Hillary runs for a camera" says a friend, Diane Blair, a **political science professor** at the University of Arkansas. (1992/01/27)
- (2) Robert A. Dahl, president of the American **Political Science Association**, said "there are bound to be evil effects" from CIA's money funnel. (1967/03/03)

- (3) No small fry was William August Schaper. Chairman of the University’s **political science department**, where he had taught 17 years, he was an internationally famed expert on taxation and government. (1938/02/07)
- (4) After all, Joan was a **political science major**, an honor student who was deeply interested in juridical philosophy-particularly as expounded by Justice Douglas. (1963/08/16)
- (5) Stolid, stocky Chang Chun, 55, “the Gissimo’s one-man brain trust” is Governor of Szechwan and leader of the top-notch circle of industrial planners known as the **Political Science Group**. (1943/03/01)

For all the most frequently used names of scientific disciplines, the adjectival collocations were inspected for their possible attributive function and are presented in separate listings for each sequence such as this found in List 1. As seen in Figure 1, relevant figures illustrating the distribution of the phrases under discussion are also provided.

political science professor(s) (63), association (17), department (12), major (12), group (8), student (6), teacher (5), graduate (4), courses (3), quarterly (3), review (3), instructor (3), fiction (*political + science fiction* rather than *political science + fiction*) (3), degree (2), club(s) (2), classes (2), [the remaining collocations were attested once] scholar, seminar, researcher, chairman, class, editor, experts, jargon, lecturer, and also political science exchange student, association award

List 1. Attributive function of *political science* in extended nominal phrases

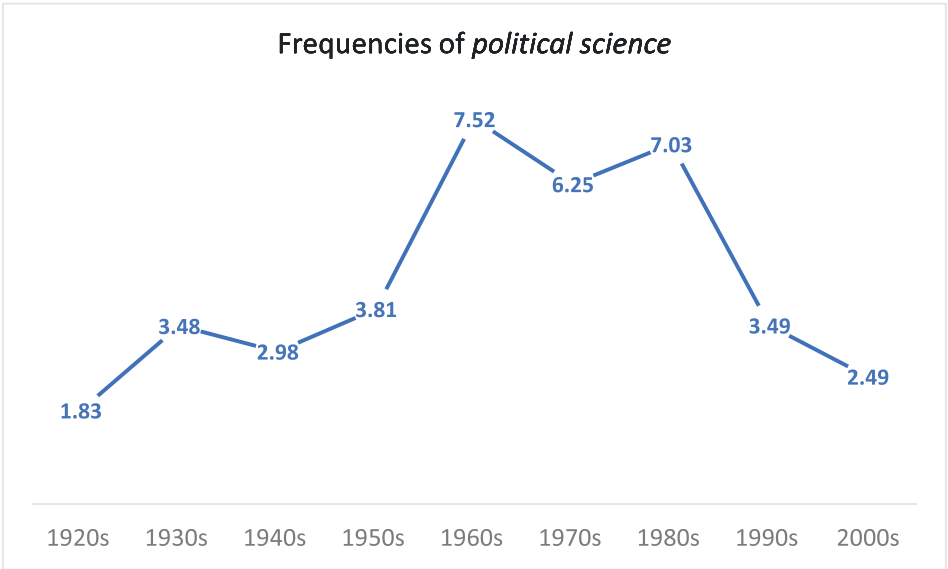


Figure 1. Diachronic frequencies of *political science* in the *Time Magazine Corpus* (number of tokens per one million words)

The illustrative sentences retrieved from the *Time Magazine Corpus* are indexed with a date of the publication of a given issue of the magazine. Other bibliographic metadata is not included for the quoted text. The *Time Magazine Corpus* is a stable resource in terms of its content and the relevant information can be accessed directly from the *English Corpora* service. In the citations of illustrative sentences, the phrases under discussion were all marked with the bold format. Plural and singular forms are counted as one type of the phrase and listed under one entry e.g. *political science* refers to both *club* and *clubs* and the listing is *political science club(s)* (2).

Misspellings and typos are rectified which may affect the actual number of the types of the retrieved phrases as in the case of *Christian Science* + noun where the collocator *practitioner* is found in three different entries as *Christian Science practitioner* (6), *Christian Science dractitioner* (1) and *Christian Science practitioner-Texas-had* (1). Additionally, *Christian Science practitioners* has two occurrences which, after correcting the misspelt words produces a total of ten tokens listed as *Christian Science practitioner(s)* (10).

DISCUSSION OF THE RESULTS

The frequency of the occurrence of *science* in American English was gradually increasing in the 20th century. This trend is found in the balanced *Corpus of Historical American English (COHA)* as well in the language of the statements from the US Supreme Court and movie dialogues. The language of movie scripts compiled in the *Movie Corpus* consists mainly of US productions but it also includes a number of Canadian films. Interestingly, the language of the movies very closely reflects the growing frequency of *science* in the *Corpus of US Supreme Court Opinions*. This correlation of movie script and legal discourse is presented in Figure 2.

The frequency of *science* found in *COHA* shows a steady increase since 1930s with a sharp rise in the 2000s. This spiking growth in frequency is confirmed by the distribution of the term *science* in the *Corpus of Contemporary American English* (cf. Figure 3). The *COCA* data is presented in a more detailed series of five-year intervals and since 1995 the frequency increases from 100 tokens of *science* per one million words to over 120 tokens. Then, more recently in the years 2015–2019 there is a slight decrease to 113, 83. These four corpora of American English, i.e. *COHA*, *COCA*, *Supreme Court Opinions* and *Movies* remain in correlation as to the growing frequency of the term *science* over their respective periods of record all of which cover the 20th century and the first decade of the 21st century. As regards the *Time Magazine Corpus*, only the increase in the 1980s and 1990s appears to correlate with the other databases. For the previous decades starting with the year of the launch of the magazine in 1923, there is an overall falling trend in the frequency of *science* in the body of *Time's* articles, cf. Figure 2. This discrepancy of the distribution of the term *science* raises a question of the representativeness of *Time's*

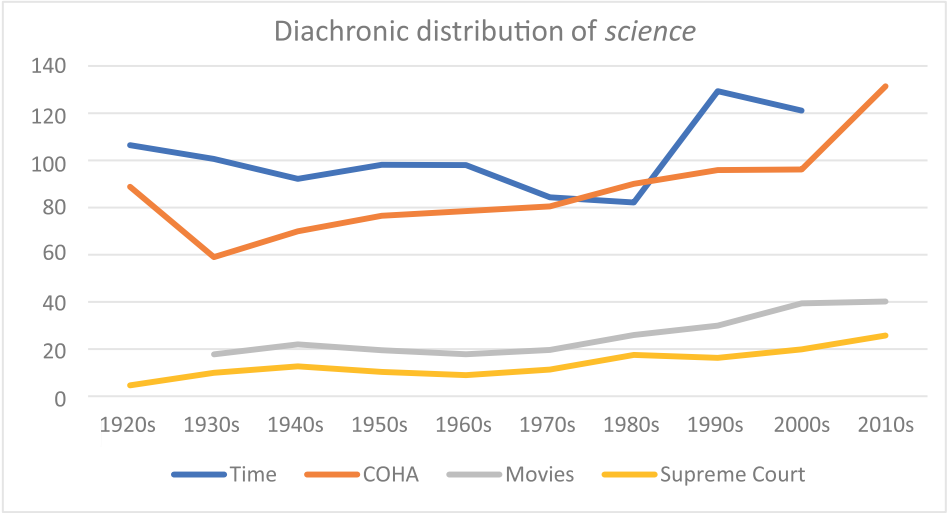


Figure 2. Diachronic frequencies of *science* in the *Time Magazine Corpus*, the *Corpus of Historical American English*, the *Movie Corpus* and the *Corpus of US Supreme Court Opinions* (number of tokens per one million words)

journalism as compared with the general language use of American English. The evidence of both balanced and genre specific collections of texts appears to be rather overwhelming and consequently the distributions of the different types of *science* will be treated with caution as to the conclusions of their general use and presence in the language at large.

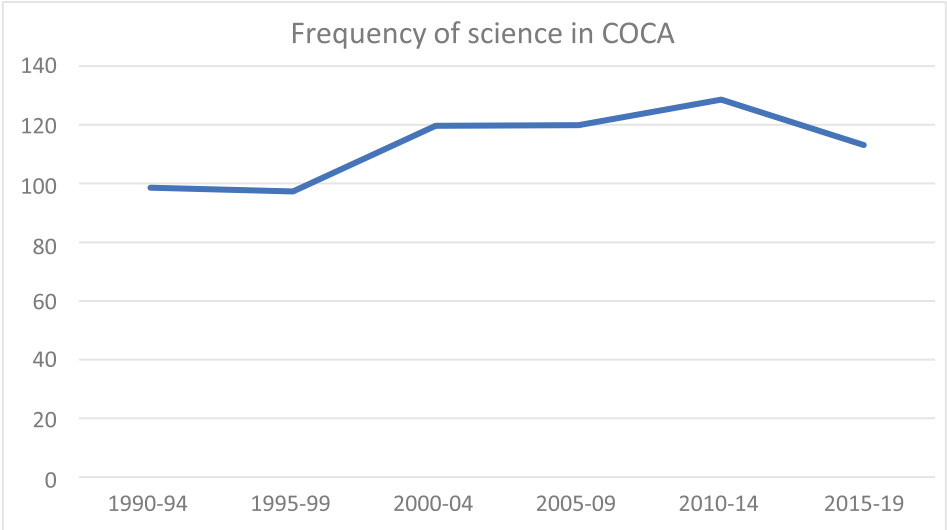


Figure 3. Frequency of *science* in the *Corpus of Contemporary American English*

With the exception of the section discussing the phrase *Christian Science*, the following sections present individual scientific disciplines expressed with an attributive adjective and the term *science* or encoded in longer syntactic phrases where *science* becomes part of attribution e.g. *social science department* or *Physical Science Study Committee*.

CHRISTIAN SCIENCE

Following *political science*, the phrase *Christian Science* is the second most frequent phrase in the *Time Magazine Corpus*. This phrase yields 444 occurrences. Interestingly, *Christian Science* is not a category of science but a name of a religious denomination which was established in America in 1878. It is first attested in the *TMC*, as seen in (6), 5 October 1923 with reference to the denomination's daily newspaper *The Christian Science Monitor*.

- (6) Following the President's speech, newspapers published a deluge of reports about its political reaction. Partisan papers flew into headlines. One side published "Harding's Speech Splits Party. "The other side (notably **The Christian Science Monitor**) ran "President Finds His Court Policy Backed by Public (1923/10/05).

The majority of the attestations are found in the attributive position of *Christian Science* in the phrases such the above-mentioned *Christian Science Monitor* with the highest frequency of 261 tokens. It is followed by *Christian Science Church(es)* with 20 tokens and *Christian Science practitioner(s)* attested 10 times. A complete listing of the attributive *Christian Science* with 43 types and 348 tokens is offered in List (2):

Christian Science Monitor (261), church(es) (20), practitioner(s) (10), publishing (4), nurse(s) (3), committee (3), club(s) (2), healer (2), healing (2), lecturer (2), leader(s) (2), literature (2), mother (2), parent (2), pavilion (2), reader (2), sanatoriums (2), spokesman(men) (2), [the remaining collocations were attested once] services, society, teacher, teachings, reader-practitioner, sanatoria, periodicals, practice, movement, official, organizations, censorship, lectures, heals, institution, committees, congregations, course, founder, friend, funeral, gospel, headquarters

List 2. Attributive function of *Christian Science* as found in the *Time Magazine Corpus*

As regards the historical distribution of *Christian Science*, it has a steady decreasing trend throughout the decades recorded in the *TMC*. The highest number of occurrences is found in the 1920s when *Christian Science* was referred to 72 times in the total of 7.6 million words while in the 2000s it was recorded only once in 6.1 million words. This single occurrence is also a reference to *The Christian Science Monitor*:

- (7) Source: New York Times; ABC News; AP; **Christian Science Monitor**.

The gradual fall of its frequency is illustrated in Figure 4.

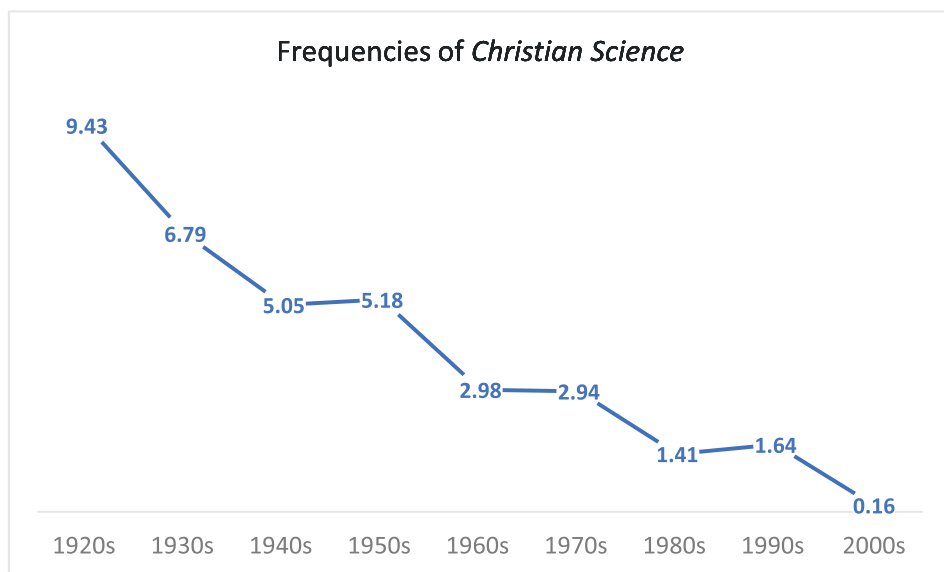


Figure 4. Diachronic distribution of *Christian Science* in the *Time Magazine Corpus* (number of tokens per one million words)

MEDICAL SCIENCE

The phrase *medical science* occurs 188 times in the *TMC*. In only three contexts *medical science* is used attributively i.e. in *medical science intervening*, *medical science center* and *medical science building* and the remaining attestations refer to the scientific study of medicine in contexts such as:

- (8) Cancer is the great enigma of **medical science** (1923/12/19).
- (9) Fattest human being ever known to **medical science** was the late Mrs. Ruth G. Pontico of Tampa, Fla., who was 5 ft. 5 in. tall and weighed 772 lb. (1942/11/02).
- (10) **Medical science** knows how to prevent tuberculosis, and it can cure most cases of the disease (1963/11/24).

As presented in Figure 5, the phrase *medical science* has a fairly stable distribution over the decades. However, the 1950s mark a spike in this trend when in the body of 16.8 million words *medical science* is attested 60 times. These attestations are evenly distributed over the years of the decade in the various issues of *Times* which means this concentration is not a result of a repeated use of *medical science* in one or two particular articles, which may occasionally happen in textual databases. For a visual illustration of the historical frequencies of *medical science* see Figure 5.

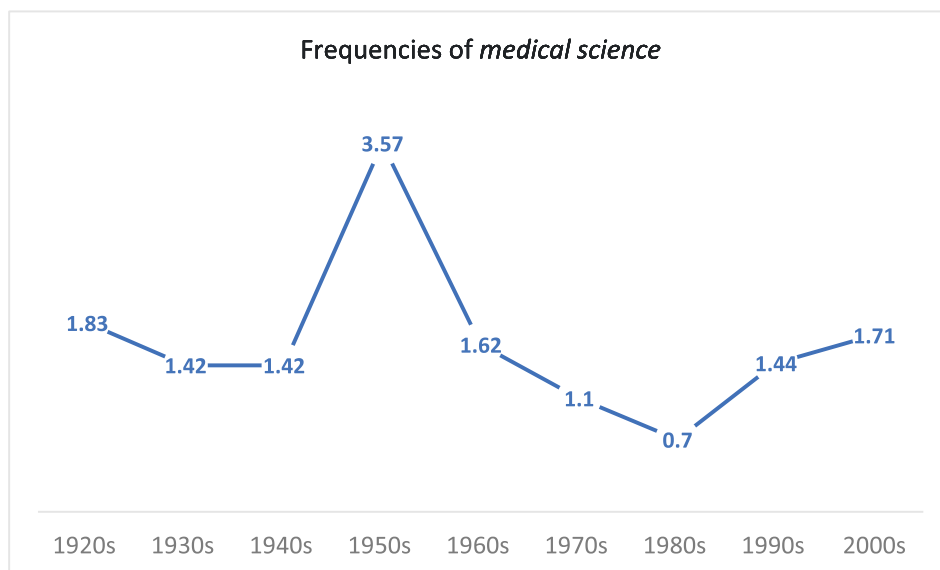


Figure 5. Diachronic distribution of *medical science* in the *Time Magazine Corpus* (number of tokens per one million words)

SOCIAL SCIENCE

The phrase *social science* has 151 occurrences in the corpus. In the majority of its attestations it is used as a name of a science devoted to the study of society. However, as presented in List 3 *social science* is used attributively in 24 types of phrases. Diachronically, the term was most frequently used in the 1950s and the 1970s, cf. Figure 6.

social science teacher(s) (5), texts (3), department (3), course (3), student(s) (3), professor (2), classes (2), building (2), research (2), techniques (2), [the remaining collocations were attested once] textbooks, review, researcher, projects, breakthroughs, books, professionals, practice, mandarins, literature, lessons, jargon, graduates, enterprise, also in social science research council (9), building (1), social science magazine Transaction (1)

List 3. Attributive *social science* as found in the *Time Magazine Corpus*

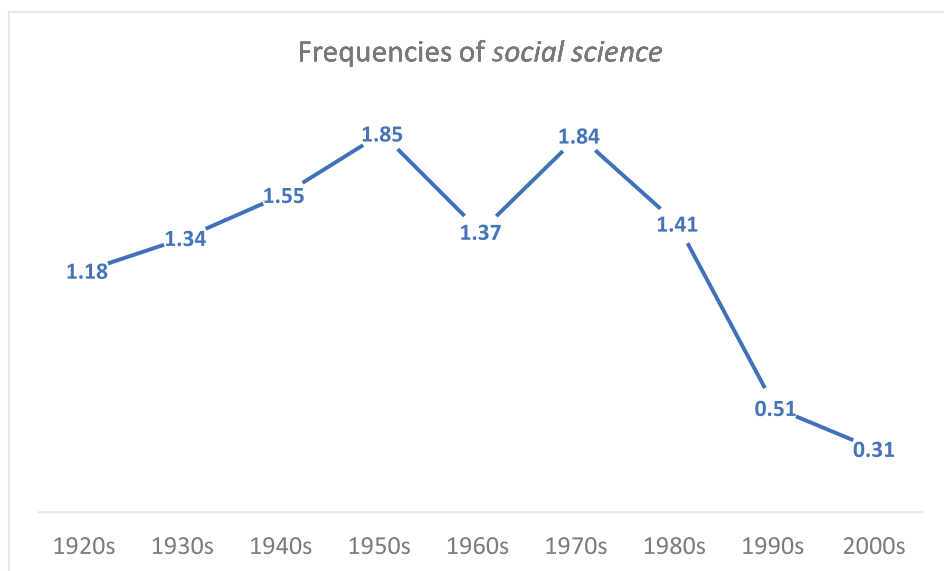


Figure 6. Diachronic distribution of *social science* in the *Time Magazine Corpus* (number of tokens per one million words)

NATURAL, MILITARY AND PHYSICAL SCIENCE

There are three names of scientific disciplines which follow the high frequency names with fewer than 100 occurrences. These include *natural science* with 46 tokens as well as *military science* and *physical science* attested respectively 36 and 27 times in the *TMC*. The vast majority of these phrases consists of the collocator *science* preceded by an attributive adjective. However, there is a number of phrases in which *natural science* functions as an attributive phrase. For *natural science*, there are six types of such phrases which include two occurrences of *natural science establishment* as well one occurrence of the following *natural science museum*, *natural science degree*, *natural science courses*, *natural science center*, *natural science bulletin*. The phrase *military science* is used as an attribute in four formations: *military science professor*, *military science department*, *military science center* and *military science department head*. Finally, *physical science* is found in four types of occurrences *Physical Science Study Committee* (3 tokens), *physical science students* (1), *physical science majors* (1) and *physical science courses* (1). The historical frequencies of *natural*, *military* and *physical* are presented in Figure 7.

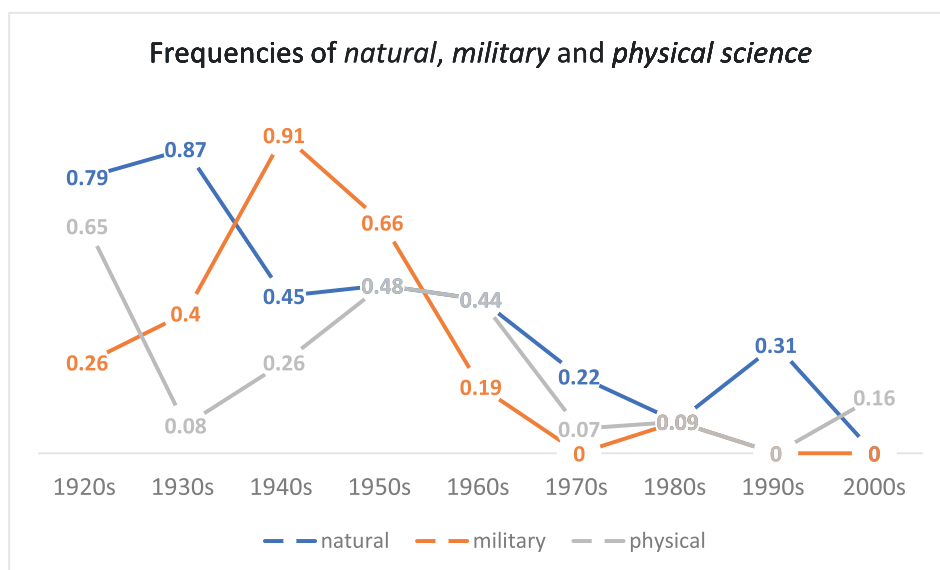


Figure 7. Diachronic distribution of *natural science*, *military science* and *physical science* in the *Time Magazine Corpus* (number of tokens per one million words)

LESS FREQUENT NAMES OF SCIENTIFIC DISCIPLINES

For the remaining phrases the sequence adjective + *science* is presented as a lexical collocating unit and the overall structure of the nominal phrase is disregarded. It is assumed, which is confirmed with the discussion of the types of science in 4.2–4.4, that the context creates associations with either science itself or scholars and scientific institutions.

The remaining terms are classified into groups of phrases which occur fewer than twenty times but more than ten. These include *atomic* (14 tokens), *nuclear* (13), *behavioral* (13), *environmental* (12) and *economic science* (11). All of these terms show lexical activity and some degree of clustering in certain decades of the 20th century. There is clearly cultural motivation for this periodically increased occurrence. As shown in Figure 8, *atomic science* and *nuclear science* are first attested in the 1940s. See also the first attestations of *atomic* and *nuclear science* in (11–12).

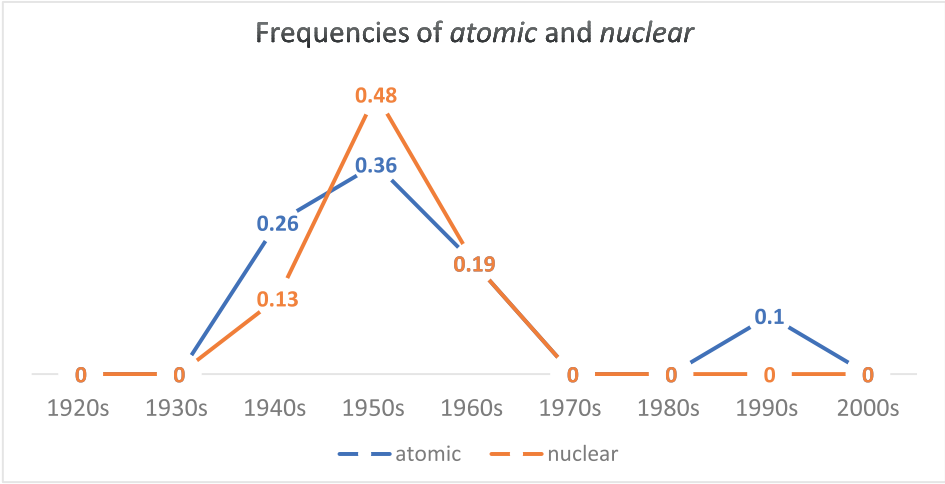


Figure 8. Diachronic distribution of *atomic science* and *nuclear science* in the *Time Magazine Corpus* (number of tokens per one million words)

- (11) Each reporter “sings” in turn: Frank McNaughton, who watches Congress like a hawk, to predict the fate of an important bill; [...] Frances Henderson to recount the latest news in **atomic science** (1946/11/18).
- (12) Peaceful applications of **nuclear science**, he said, have “an A–2 priority” (1947/08/25).

Figure 9 presents the historical distribution of *behavioral science*, *environmental science* and *economic science* and in (13–15) the first citations of these terms are listed.

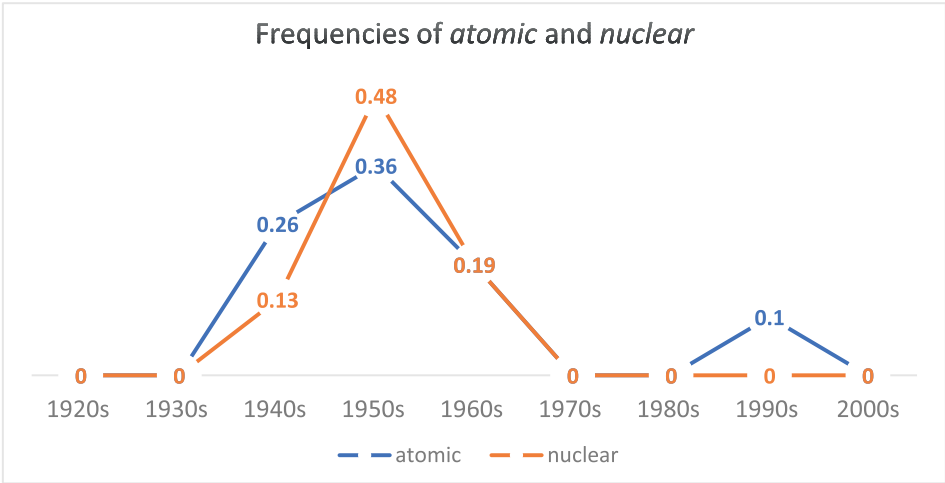


Figure 9. Diachronic distribution of *behavioral science*, *environmental science* and *economic science* in the *Time Magazine Corpus* (number of tokens per one million words)

- (13) Happily, nonscholars may turn this week to Human Behavior: An Inventory of Scientific Findings (Harcourt, Brace & World; \$11), the first plain-English compendium of **behavioral science's** best-tested propositions (1964/02/14).
- (14) All these related functions-and many more-are now controlled and operated by the **Environmental Science** Services Administration (ESSA), the bounciest baby bureaucracy in Big Government Science (1966/08/26).
- (15) In the early 1880's Abraham Flexner was a student there, while Dr. Richard Theodore Ely was busy founding its chair of **economic science** (1933/04/10).

For the purposes of contextual illustration, the phrases attested between three to ten times are presented with corpus example sentences. These include *biological science* (10 tokens), *marine science* (10), *forensic science* (9), *agricultural science* (9), *aeronautical science* (6), *planetary science* (6), *naval science* (6), *veterinary science* (5), *genetic science* (5), *religious science* (4), *arctic science* (3), *astronautical science* (3), *cardiac science* (3), *sexual science* (3). The illustrative sentences in (16–29) are the first attestations of these names of scientific disciplines in the *TMC*.

- (16) He devoted his time to a retrospective view of **biological science**, and particularly to the theory of organic evolution and its place in the scheme of life (1924/01/07).
- (17) Leader of the expedition was Dr. C.M. Yonge, Englishman, whose essays on **marine science**, *Vueer Fish*, Brentano's has just published (\$2.50) (1929/04/01).
- (18) It took a whole crew of doctors, pharmacists and experts from the **Home Office Forensic Science Laboratory**, using 1,220 mice, 150 rats and 24 guinea pigs, to find out (1958/09/08).
- (19) To Professor Rice, founder (1903) and retired (1934) head of Cornell's first U. S. poultry school, goes credit, too, for fathering poultry breeding as an **agricultural science** (1939/08/07).
- (20) John Augustus Rodgers, San Francisco-Honolulu flyer Master of **Aeronautical Science** (1926/06/28).
- (21) Eric Becklin, a graduate student in physics, and James Westphal, a senior research fellow in **planetary science**, not only obtained the first temperature measurements ever made of a comet, they also gained valuable insight into a comet's composition and behavior (1966/09/09).
- (22) He won a medal in naval architecture, received a \$50 prize awarded by the Daughters of the American Revolution for being the best student in **naval science** (1955/08/15).
- (23) Pink, worn by doctors of music, was prescribed (in brocade) at Oxford. #The olive of Pharmacy, lilac of Dentistry, russet of Forestry, gray of **Veterinary Science**, lemon of Library Science [...] (1925/06/15).
- (24) All his work has been done by three simple methods of **genetic science**, not original with him but brought to their highest efficiency by his exhaustive knowledge and the super-keenness of his senses [...] (1923/06/04).
- (25) From the pool and dance and spiritualist halls to Dr. Pryor's Holy Floor Wash Factory and King Solomon's Temple of **Religious Science**, there was holiday (1946/06/27).
- (26) Of that hardy, hairy crew who prowl for Soviet glory north of Russia's long Arctic coast line, hardest and hairiest is jungle-bearded Otto Tulyevich Schmidt, chief editor of the Soviet Encyclopedia, professor of hydrology, chemistry and **Arctic science** (1934/02/26).

- (27) That over, the astronauts flew to the University of Michigan at Ann Arbor, where each was solemnly awarded a newly created honorary degree –a doctorate of **astronautical science** (1965/06/25).
- (28) The engineer probably didn't much care that the AED used on him was made by a little company now called **Cardiac Science** (2003/06/09).
- (29) The book is based on personal interviews and data furnished by Professor Steinach himself and several of his disciples, including [...] Dr. Magnus Hirschfeld, of the Institute for **Sexual Science**, Berlin [...] (1923/12/10).

Finally, there are several phrases with two occurrences each where the adjective referring to the type of a scientific discipline functions as an attribute of the collocator *science*. These include *archeological*, *cardiovascular*, *lunar*, *optical*, *sanitary*, *surgical*, *sound*, *stem-cell*.

NOMINAL COMPOUNDS INVOLVING SCIENCE

Apart from the nominal phrases consisting of attributive adjectives discussed in the previous sections, attributes of *science* can also be found in nominal compounds involving *science* as the head of these syntactic units. However, the search query of “noun + science” yields a smaller number of both types and tokens. The *Time Magazine Corpus* contains 194 types represented with 618 tokens of the “noun + science” search string while “adjective + science” yielded a total of 527 types represented with 3,134 tokens. The most frequent phrases of the nominal compounds are presented in the Table.

Table 1. Attributes of *science* in nominal compounds in the *Time Magazine Corpus* (number of occurrences of the types represented with more than ten tokens)

Types	To- kens	1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s
computer science	62					1	4	35	12	10
journal science	55			1	1	3	3	9	23	15
school science	37	1			9	6	2	10	5	4
space science	23					7	2	4	7	3
house science	18				2	2	5	4	5	
life science	18		1	2		2	13			
creation science	18							11	6	1
library science	17	1	1	1	3	6	4		1	

Table: 1 cont.

rocket science	17							6	11
mystery science	15							13	2
telescope science	11						1	7	3

As regards the names of scientific disciplines, the terms of *computer science* (62 tokens), *space science* (23) and *library science* (17) denote distinct forms of scientific activity. The highest number of the occurrences of *computer science* is recorded for the 1980s, the time of the emergence and initial development of computer technology. The first attestations of *computer science* and *space science* is offered in (30–31).

- (30) He [...] set top scholars to work on studies of vital contemporary problems ranging from birth control to **computer science** to urban planning (1968/08/30).
 (31) And by taking strength from the sun, the balloon has taught **space science** a trick that will certainly be useful when Echo I is joined by Echo II [...] (1961/08/11).

The term *library science* was most frequently referred to in the 1960s and 1970s but with one occurrence in the 1990s its use is almost discontinued in the subsequent decades.

CONCLUSIONS

The present study revealed the lexical patterns of the term *science* in relation to the types of scientific activity these patterns denote. Two of the three most frequent phrases refer to *political science* attested by 504 tokens and *medical science* with 188 occurrences. *Christian Science* was the second most commonly used phrase (with 444 tokens) which might evoke associations with scientific activity exercised from a Christian standpoint but actually it is used as a name of a religious denomination. The other top phrases referring to various scientific disciplines include *natural science*, *military science*, *physical science*, *atomic science*, *behavioral science*, *nuclear science*, *environmental science*, *economic science*, *biological science* and *marine science*. The majority of these phrases show discernible diachronic distribution trends that are influenced by cultural processes or by cultural processes or historical contexts e.g. the 1940s is the peak occurrence of *military science*, in the 1960s *political science* has the biggest number of occurrences and the 1950s is the time of the most frequent use of *atomic science* and *nuclear science*. In a similar way,

culture-motivated tendencies can be noticed in the distribution of the compound *computer science* with the highest frequency of 3.08 tokens in the 1980s and the compound *space science* with the highest frequencies in the 1960s and the 1990s.

The overall distribution of *science* in the *Time Magazine Corpus* points to the 1990s as the decade that attracted the largest number of the occurrences of this term i.e. 1259 tokens, statistically 129.32 occurrences per one million words of text. For the previous decades, the corpus marks a decreasing trend from 106.48 occurrences in the 1920s to 82.13 in the 1980s. This falling trend is not confirmed by other diachronic corpora of American English which provide evidence for a continued increasing trend of the frequencies of *science*. For instance, the textual data available from the *Corpus of Historical American English* marks an increase in the frequency of *science* from 58.97 tokens per one million words in the 1930s to 96.12 in the 2000s. Similar rising trends are found in the data retrieved from the genre specific *Corpus of US Supreme Court Opinions* and the *Movie Corpus*. This raises a question of the value of the *Time Magazine Corpus* as a database representative of American English and general cultural trends. The *TMC* data should be treated with caution and preferably verified against other corpus data sets. Despite this reservation, the *Time Magazine Corpus* is an appropriate resource for studying journalistic discourse and the representation of cultural topics reported in the articles published in *Time Magazine*.

As regards the semantic scope of the term *science*, it appears that two of its senses can be attributed to the phrases discussed in this paper. In the *OED* classification of the semantics of *science* these two meanings are indexed as 4b (a branch of study that deals with a connected body of demonstrated truths or with observed facts systematically classified and more or less comprehended by general laws) and 5a (the kind of organized knowledge or intellectual activity of which the various branches of learning are examples).

From a methodological point of view, corpus methodology of text analysis offers a reliable research tool which provides historical study of scientific activity with relevant and insightful data. Retrieval of such information requires access to written text which sets a time limit for historical investigations, however, historical accounts of modern times will certainly benefit from this methodological approach.

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