Galton 2011 revisited: a bibliometric journey in the footprints of a universal genius

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Abstract  Commemorating the 100th death anniversary of Francis Galton, this paper is a bibliometric impact analysis of the works of this outstanding scientist and predecessor of scientometrics. Citation analysis was done in Web of Science, Scopus and Google Scholar (Publish or Perish) in order to retrieve the most cited books and journal articles. Additionally references were identified where Galton was rather mentioned than cited in order to analyze the phenomenon of obliteration by incorporation. Finally occurrence counts of Galton’s works in obituaries, Festschrift, the website Galton.org, major encyclopaedias and biographical indexes were compared to citation counts. As an outcome Galton’s works are increasingly cited or mentioned. Obliteration (use of eponyms) applies to one-third of Galton’s works and seems to be typical for fields like mathematics or statistics, whereas citations are more common in psychology. The most cited books and journal articles are also the most mentioned with remarkable correlation. Overall citation analysis and occurrence counting are complementary useful methods for the impact analysis of the works of “giants”.

Keywords  Francis Galton · Citation analysis · Web of science · Scopus · Google scholar · Obliteration · Occurrence counts · Historiometry · History of science

Background

Our passion for Francis Galton goes back to the reading of De Solla Price’s book “Little science, big science”, a book that crystallized a new element in the historiography and sociology of science (Price 1963). An entire chapter—titled “Galton revisited”—is devoted to the all-rounder of science, one of the most versatile and curious minds of the nineteenth century. Apart from his achievements in various fields as explorer, geographer, meteorologist, geneticist, psychologist and eugenicist, particular emphasis has been placed
on his passion to count and quantify everything and reduce it to statistics, e.g. computing the additional years of life enjoyed by the Royal Family and the clergy because of the prayers offered up for them (the surprising result being a negative number), or correlating the number of a painter’s brush strokes needed for a portrait (approx. 20,000) with the hand movements that went into the knitting of a pair of socks (Pearson 1914–1930).

His obsession was not only the stimulus for the foundation of biometrics. It can also be considered as the rise of a new era for the social sciences based on the solid foundation of quantified measurements and statistical methods. This is especially true for new emerging disciplines like bibliometrics or scientometrics. Being a statistician, Galton introduced new statistical concepts like regression and correlation in order to analyze the large amounts of data he accumulated (Obituary 1911; Forrest 1974; Gillham 2001). He introduced also the idea of the percentiles as a criterion for the measurement of the distribution of quantitative parameters (Enciclopedia Italiana 1950).

A neglected but influential contribution by Galton is also the measurement of science (Godin 2007). In Galton’s monograph “English Men of Science” (1874), he conducted a sociological study based on a survey of 180 outstanding British scientists. This analysis inspired the launch of Cattell’s directory “American Men of Science” (Cattell 1906). Moreover the method described in Hereditary Genius (Galton 1869) can be regarded as the first example of historiometry (Wikipedia English 2010).

Furthermore Galton was one of the first scientists who made use of “mapping” methods. Thus he developed a “beauty-map” of the British Isles, based on how many pretty women he encountered, giving London the highest score and Aberdeen the lowest.

Today Galton’s “beauty-map” is still a hot topic, as corroborated by a study done by Swami and Hernandez (2008) who compiled a more empirical beauty-map of London. They discussed their results in relation to the association between wealth and attractiveness, and compared their findings to Galton’s original beauty-map.

Galton was an extraordinary and prolific scientist, producing almost 20 books and more than 300 papers. In commemoration of the 100th anniversary of Galton’s death and in appreciation of his crucial contributions to scientometrics, we devote this bibliometric study to this likewise controversial but also fascinating personality.

Introduction

The achievements and merits of a famous scientist or—reusing Galton’s vocabulary—of a “genius”, can be tracked by several methods:

(1) Obituaries: announcement of a death including a short biography giving an account of the life of a notable individual focusing on the most important works and deeds.
(2) Festschriften: an article or book honouring a respected person, especially an academic
(3) Biographies: detailed descriptions or accounts of someone’s life. A biography is more than a list of impersonal facts (education, work, relationships, and death), it also portrays the subject’s experience of those events (http://en.wikipedia.org/wiki/Biography). Biographies need to be considered as subjective, since their authors mostly have a certain agenda and subject expertise.
(4) Websites: with the advent of the internet many historical celebrities have their own website maintained by institutions like foundations, museums, societies, libraries, etc. keeping them in honouring memory.
(5) Entries in major encyclopaedias or biographical indexes
As Cronin stated “by citing other works, authors create footprints in the landscape of scholarly achievement” (Cronin 1984, 1995). Citation analyses enable to identify the most influential works (publications) of a renowned scientist. In our study, influential can be regarded as a synonym for “most impact”.

However, their works are not always cited but merely mentioned.

Mentions can be tracked by the counting of occurrences in biographical sources. This also includes “Obliteration by incorporation” (OBI), a concept introduced by Robert K. Merton and picked up again by Garfield, occurs when at some stage in the development of a science, certain ideas become so generally accepted that their contributors are no longer cited (Merton 1968, 1996; Garfield 1975; Messeri 1978). Discoveries and innovations are then often named after the (supposed) discoverer. And eventually, its source and creator are forgotten (“obliterated”) as the concept enters common knowledge (is “incorporated”). In the process of OBI both the original idea and the literal formulations of it are incorporated due to prolonged and widespread use in the title, abstract or full-text of the documents, and enter into everyday language (eponyms) or at least the controlled language of a given academic discipline (descriptors in thesauri), and can either be attributed to their creator or not.

Scope of the analysis

This bibliometric analysis comprises of the following aspects:

1. Citation versus mentioning: volume proportions and time line
2. Analysis of citing/mentioning institutions/countries: Who is still citing/mentioning Galton?
3. Analysis of citing/mentioning sources: In which journals/research fields is Galton still cited/mentioned?
4. Analysis on the loss of citations caused by OBI, i.e. by mere mentioning instead of citing or by using eponyms (in the form of descriptors)?
5. Identification of Galton’s high impact publications (monographs and journal articles)
6. Analysis of citation differences based on the selected data source, comparison of the 3 most important citation databases WoS, Scopus and Google Scholar; correlation of the results
7. To which extent are Galton’s most highly cited publications in agreement with the publications considered as the most relevant by (a) his biographers or by (b) other sources like encyclopaedias, dictionaries, etc. (see Introduction); correlation of the results
8. General purpose:

Are bibliometric and scientometric methods, like citation or occurrence counts, appropriate for the study of the history and sociology of science? Can their results be validated by other qualitative measurements?

Methodology

Web of Science (WoS), Scopus and Google Scholar were used as the major citation databases for the citation analyses. Searches were done in September 2009, and all
retrieved records were manually disambiguated respectively in order to identify the most cited documents (monographs and journal articles).

**WoS**

The main analysis (citation and obliteration) was performed in WoS due to its strict selection criteria focusing on the “best” (higher impact) literature, due to its interdisciplinary character and its comprehensive coverage (“Century of Science”).

The citation analysis was conducted using the “Cited reference search” feature in WoS. All citing documents and all citations to documents authored by “Galton F” were retrieved.

An additional search for “Galton” was performed in order to identify all citations where Galton was cited without or with a wrong first name. Citations of co-authored publications (e.g. the famous one with Watson) have been also retrieved searching for the co-author name. Citations have been added accordingly.

Two different types of documents were separately analyzed: monographs (books) and journal articles.

For monographs citations were collected separately for the “most correctly cited edition”, for the “most cited edition”, and to “all editions”. The latter were used to calculate the correlation.

According to Galton’s publication strategy, i.e. publication of articles with the same title in multiple journals, articles were aggregated on title level.

A complementary search was performed in WoS in order to retrieve all publications mentioning “Galton” either in their titles, descriptors or abstracts. This should give an idea of how many citations have already been assimilated by the scientific community (OBI) and how many publications have therefore ceased to be cited directly any longer.

The search was restricted to the field “Topic”. All the retrieved documents were separately analysed regarding their occurrence in the above mentioned bibliographical fields. Finally all these documents were classified according to which Galton’s eponym, “notion” or “concept” was mentioned or referred to.

**Complementary analyses in Scopus and Google Scholar**

The search in Scopus was performed in the “References” field. All references containing the name “Galton” were retrieved. Data cleansing was done to exclude “wrong” Galton references as well as citations to secondary literature. The most cited articles and books were aggregated and analyzed separately.

The search in Google Scholar was done with the help of the open source “Publish or Perish” tool, and the retrieved items were either assigned to monographs or to journal articles. The results were compared those obtained from WoS and other bibliographical sources, and either corrected or added.

**Sources for assignment of disambiguated records**

Correct assignment of the manually disambiguated Galton publications was done by using the sources described in *Correlation analyses*. Furthermore, JSTOR, a trusted full-text digital archive of over one thousand academic journals across the humanities, social...
Correlation analyses

Correlation analyses of the most cited documents with occurrences in biographical sources and encyclopaedias were performed using the Pearson correlation coefficient. The analyses were initially done for monographs. In a subsequent study correlation analyses will also be performed for journal articles. Their inclusion would have been too bulky and therefore out of the scope of this paper.

Part A:

Citations were first compared with the retrieved occurrences in the following selected biographical sources:

1. Obituaries, Festschrift and Galton.org:
   - The obituaries on Galton from the Royal Statistical Society (Obituary 1911) and from Gray (1911) in “Man” were considered due to their wider scope, however, both still have a subject specific focus.
   - Others like the one from the Royal Geographical Society Institute (Obituary 1911a) and from Beddoe (1911) were either too specific or did not include bibliographical items. They were therefore not considered in this approach.
   - As a showcase for a Festschrift the commemorative article by Corney (1984) was included.
   - The website “Galton.org” was added to this subset due to its similar characteristics.
   - It is a non-funded initiative edited and maintained by Gavan Tredoux. It aims to provide access to everything that Galton wrote, usually in facsimile format. Most of it is searchable, however, OCR recognition has known limits and retrieval accuracy depends on the quality of the scanned resources.
   - The website furthermore contains reviews of Galton’s works, extensive biographical information as well as photographs and portraits of the protagonist.
   - The website is organized according to the different subject areas Galton dealt with. These sections contain selected works, which are subsets of the whole bibliography available as “Collected Works”.
   - Occurrences of Galton’s works were retrieved manually in obituaries and the Festschrift. Occurrences retrieved in the subject specific sections of Galton.org were counted separately from the ones retrieved in “Collected Works”.

2. Biographies
   - The four most famous and also most cited (in WoS and Scopus) biographies from Gillham, Pearson, Bulmer and Forrest were chosen.
     - Gillham’s biography (2001): one of the most recent, most reviewed and most cited biographies on Galton.
     - Occurrences were identified manually in the prologue “Francis Galton in Perspective” (providing an overview of the most important facts and works).
(b) Pearson’s biography (The Life, Letters and Labours of Francis Galton, 1914, 1924, 1930): a facsimile version is provided at “Galton.org”, and occurrences were identified manually in the “table of contents” part (“Contents”).

(c) Bulmer’s biography (Francis Galton: Pioneer of Heredity and Biometry, 2003): available via Google Books (http://books.google.com/books?id=vL0hq80XXqMC&hl=de&source=gbs_ViewAPI):

Occurrences were identified manually in the “table of contents” part and in the “chronology” part.

The biography of Forrest could not be considered for Part A of this analysis, since preface and “table of contents” part do not contain any bibliographical references.

(3) Major encyclopædias and biographical indexes

Occurrences of Galton’s work were identified manually in entries of the following encyclopædias:

Britannica, Larrousse, Colliers, Brockhaus, Espasa Calpe, Encyclopedia Americana and Enciclopedia Italiana.

Complementary analyses were done in both the English and the German edition of Wikipedia, Poggendorff and Oxford DNB (Schwartz Cowan 2004).

For detailed information on titles and editions see References.

Spearman correlations between occurrence counts in (1), (2) and (3) and the number of citations in WoS, Google Scholar and Scopus were calculated separately for each subset as well as in total.

Part B

Complementary to Part A the overall occurrences of the 4 selected biographies were determined.

In Gillham as well as in Forrest book titles were looked up in the index and the corresponding pages were counted. A previous analysis showed that occurrence counts in the book’s full text highly correlated with the above mentioned page counts (Spearman correlation coefficient = 0.97).

In Pearson the overall occurrences were retrieved by using the “Search function” provided by the facsimile version on Galton.org, whereas in Bulmer they were identified with the help of the “Search function” in Google Books. Both were checked for correctness and false hits removed.

Spearman correlations between page/occurrence counts for each biography and the number of citations in WoS, Google Scholar and Scopus were calculated.

Results

Results from the comparison “citing” vs. “mentioning”

The WoS search for “Galton F*” resulted in 1336 hits that were further analysed to extract 5628 citations, 1835 citing articles and to determine the value of the indicator “citations per citing article” (3.07).

The additional search for “Galton” was performed to identify data base entries with either no or the incorrect first name. That way another 240 citations and 172 citing
documents were retrieved. The “Citations per citing article” indicator was determined as 1.53. Details are shown in Table 1.

A complementary search for publications where Galton was rather mentioned than cited (TS = (galton*)) resulted (after data cleansing) in the retrieval of 1.083 mentioning publications and 121 (4%) citing and mentioning publications (see Fig. 1).

The following figure shows comparative timelines of citing vs. mentioning articles (Fig. 2).

Both the number of citing and mentioning articles has gradually increased within the last 50 years according to the increment of growth in the scientific world output.

The run of both curves is similar, thus citing is not replaced by mentioning in the course of time. Both rather coexist to the same extent.

A comparison of citation vs. mention behaviour was done according to subject areas, sources, institutions and countries.

**Subject areas**

Psychology, Anthropology, Psychiatry and History & Philosophy of Science are the top “Galton-citing” disciplines, whereas in Statistics and Mathematics the mentioning culture is most established. Detailed results are shown in Table 2.

**Sources**

In compliance with the results obtained for “Subject Areas”, the top-citing sources are psychological and anthropological titles, whereas the top-mentioning sources belong to statistics. Detailed results are listed in Table 3.

**Institutions**

The top-citing institutions are entirely Anglo-American, whereas the ranking list of mentioning institutions is more diverse and also includes institutions from Spain, France, Bulgaria, Germany and Taiwan (see Table 4).

**Countries**

The comparison of the country rank lists shows much compliance in the 6 top ranks. The other countries show less consistency in their preferences. Some nations rather prefer to cite than to mention and vice versa, e.g. the percentage of citing vs. mentioning articles is twice as high for the USA, whereas the percentage of mentioning vs. citing articles is five times higher for France. Details are shown in Table 5.

| Search string in WoS | Hits | Citations | Citing publications | Citations per publication |
|----------------------|------|-----------|---------------------|--------------------------|
| Galton F*            | 1.336| 5.628     | 1.835               | 3.07                     |
| Galton or Galton X*  | 240  | 263       | 172                 | 1.53                     |
| Total                | 1.576| 5891      | 2007                | 2.93                     |
Table 2 Top subject areas in citing versus mentioning Francis Galton

| WoS subject category (citing)                  | Counts | %     |
|-----------------------------------------------|--------|-------|
| Psychology, Multidisciplinary                 | 272    | 13.55 |
| Psychology                                    | 123    | 6.13  |
| Anthropology                                  | 107    | 5.33  |
| Psychiatry                                    | 105    | 5.23  |
| History & Philosophy of Science               | 98     | 4.88  |
| Psychology, Social                           | 97     | 4.83  |
| Genetics & Heredity                          | 96     | 4.78  |
| Sociology                                     | 87     | 4.33  |
| Psychology, Experimental                      | 83     | 4.14  |
| Psychology, Educational                       | 81     | 4.04  |
| Education & Educational Research              | 76     | 3.79  |
| Statistics & Probability                     | 62     | 3.09  |
| Biology                                       | 60     | 2.99  |
| Neurosciences                                 | 56     | 2.79  |
| History                                       | 54     | 2.69  |
| Medicine, General & Internal                  | 49     | 2.44  |
| Multidisciplinary Sciences                    | 49     | 2.44  |
| Education, Special                           | 43     | 2.14  |
| Psychology, Developmental                     | 41     | 2.04  |
| Evolutionary Biology                          | 40     | 1.99  |
| Psychology, Clinical                          | 39     | 1.94  |
| Economics                                     | 38     | 1.89  |

| WoS subject category (mentioning) counts       | Counts | %     |
|------------------------------------------------|--------|-------|
| Statistics & Probability                      | 432    | 39.89 |
| Mathematics                                   | 96     | 8.86  |
| Mathematics, Applied                          | 58     | 5.36  |
| Biology                                       | 47     | 4.34  |
| History & Philosophy of Science               | 45     | 4.16  |
| Anthropology                                  | 45     | 4.16  |
| Psychology, Multidisciplinary                 | 40     | 3.69  |
| Genetics & Heredity                           | 36     | 3.32  |
| Social Sciences, Biomedical                   | 33     | 3.05  |
| Mathematical & Computational Biology          | 32     | 2.95  |
| Multidisciplinary Sciences                    | 30     | 2.77  |
| Social Sciences, Interdisciplinary             | 29     | 2.68  |
| Economics                                     | 26     | 2.40  |
| Physics, Multidisciplinary                    | 22     | 2.03  |
| Psychology, Clinical                          | 20     | 1.85  |
| Computer Science, Software Engineering         | 19     | 1.75  |
| Evolutionary Biology                          | 18     | 1.66  |
| Psychology                                    | 17     | 1.57  |
| Physics, Mathematical                         | 16     | 1.48  |
Table 2 continued

| WoS subject category (mentioning) counts | Counts | %  |
|----------------------------------------|--------|----|
| Ecology                                | 16     | 1.48|
| Political Science                      | 14     | 1.29|
| Behavioral Sciences                    | 13     | 1.20|

Fig. 1 Citing vs. mentioning in WoS

Fig. 2 Time line of citing/mentioning articles in WoS
| WoS source (citing)                                                                 | Counts | %   |
|------------------------------------------------------------------------------------|--------|-----|
| American Psychologist                                                             | 31     | 1.54|
| Personality and Individual Differences                                            | 26     | 1.30|
| American Journal of Physical Anthropology                                        | 22     | 1.10|
| Gifted Child Quarterly                                                            | 20     | 1.00|
| Journal of Personality and Social Psychology                                      | 20     | 1.00|
| Intelligence                                                                      | 17     | 0.85|
| Journal of Creative Behavior                                                      | 15     | 0.75|
| Zeitschrift fur Morphologie und Anthropologie                                     | 15     | 0.75|
| Journal of the History of the Behavioral Sciences                                | 15     | 0.75|
| American Journal of Psychology                                                    | 14     | 0.70|
| Mankind Quarterly                                                                 | 14     | 0.70|
| Psychological Reports                                                             | 14     | 0.70|
| ISIS                                                                              | 13     | 0.65|
| Psychological Bulletin                                                            | 13     | 0.65|
| American Journal of Psychiatry                                                    | 12     | 0.60|
| Creativity Research Journal                                                       | 12     | 0.60|
| Memory & Cognition                                                                | 12     | 0.60|
| Journal Of Heredity                                                               | 11     | 0.55|
| Nature                                                                            | 11     | 0.55|
| American Sociological Review                                                      | 10     | 0.50|
| British Journal for The History of Science                                        | 10     | 0.50|
| IEEE Transactions on Pattern Analysis and Machine                                 |        |     |
| Intelligence                                                                      | 10     | 0.50|
| Psychological Monographs                                                          | 10     | 0.50|

| WoS source (mentioning)                                                           | Counts | %   |
|------------------------------------------------------------------------------------|--------|-----|
| Journal of Applied Probability                                                    | 84     | 7.76|
| Annals of Probability                                                             | 35     | 3.23|
| Advances in Applied Probability                                                   | 34     | 3.14|
| Theory of Probability and its Applications                                        | 29     | 2.68|
| Stochastic Processes and their Applications                                       | 29     | 2.68|
| Statistics & Probability Letters                                                  | 24     | 2.22|
| Eugenics Review                                                                   | 24     | 2.22|
| Annals of Mathematical Statistics                                                 | 15     | 1.39|
| Probability Theory and Related Fields                                             | 13     | 1.20|
| Annales De L Institut Henri Poincare-Probabilites Et Statistiques                 | 13     | 1.20|
| Behavior Science Research                                                         | 11     | 1.02|
| Journal of the History of the Behavioral Sciences                                | 11     | 1.02|
| Random Structures & Algorithms                                                    | 11     | 1.02|
| Annals of Applied Probability                                                    | 11     | 1.02|
| Nature                                                                            | 10     | 0.92|
| Current Anthropology                                                              | 9      | 0.83|
| ISIS                                                                              | 9      | 0.83|
### Table 3 continued

| WoS source (mentioning)                        | Counts | %  |
|-----------------------------------------------|--------|----|
| Stochastic Analysis and Applications          | 9      | 0.83|
| Behavior Genetics                             | 8      | 0.74|
| Journal of The History Of Biology             | 7      | 0.65|
| Annals of Science                             | 7      | 0.65|
| Journal of Theoretical Probability           | 7      | 0.65|

### Table 4  Top institutions citing versus mentioning Francis Galton

| WoS institutions (citing)                  | Counts | %  |
|--------------------------------------------|--------|----|
| Univ Calif Davis                           | 45     | 2.24|
| Univ Minnesota                             | 27     | 1.35|
| Duke Univ                                  | 27     | 1.35|
| Harvard Univ                               | 27     | 1.35|
| Univ Illinois                              | 22     | 1.10|
| Univ Chicago                               | 21     | 1.05|
| Univ Calif Berkeley                        | 19     | 0.95|
| Johns Hopkins Univ                         | 17     | 0.85|
| Yale Univ                                  | 17     | 0.85|
| Michigan State Univ                        | 17     | 0.85|
| Columbia Univ                              | 17     | 0.85|
| Univ Wisconsin                             | 16     | 0.80|
| York Univ                                  | 16     | 0.80|
| Cornell Univ                               | 15     | 0.75|
| Univ Michigan                              | 15     | 0.75|
| Univ Western Ontario                       | 15     | 0.75|
| Univ N Carolina                            | 14     | 0.70|
| Inst Psychiat                              | 13     | 0.65|
| Penn State Univ                            | 13     | 0.65|
| Univ Cambridge                             | 13     | 0.65|
| Univ Toronto                               | 13     | 0.65|
| UCL                                        | 12     | 0.60|
| Univ London                                | 12     | 0.60|
| Univ Texas                                 | 12     | 0.60|

| WoS institutions (mentioning)              | Counts | %  |
|--------------------------------------------|--------|----|
| Univ Calif Berkeley                        | 31     | 2.86|
| Univ Extremadura                           | 26     | 2.40|
| Univ Paris 11                              | 17     | 1.57|
| Univ Paris 06                              | 15     | 1.39|
| Univ Wisconsin                             | 14     | 1.29|
| UCL                                        | 13     | 1.20|
| York Univ                                  | 13     | 1.20|
**Table 4 continued**

| WoS institutions (mentioning)       | Counts | %     |
|------------------------------------|--------|-------|
| Bulgarian Acad Sci                 | 13     | 1.20  |
| Ecole Normale Super                 | 13     | 1.20  |
| Harvard Univ                        | 13     | 1.20  |
| Chalmers Univ Technol               | 12     | 1.11  |
| Univ Chicago                        | 12     | 1.11  |
| Northwestern Univ                   | 11     | 1.02  |
| Natl Taiwan Univ                   | 11     | 1.02  |
| Univ Frankfurt                      | 11     | 0.92  |
| Chalmers                            | 10     | 0.92  |
| Univ Melbourne                      | 10     | 0.92  |
| Univ Oxford                         | 10     | 0.92  |
| Univ Rennes 1                       | 9      | 0.83  |
| Univ Sheffield                      | 9      | 0.83  |

**Table 5** Top countries citing versus mentioning Francis Galton

| WoS country (citing)     | Counts | %     |
|--------------------------|--------|-------|
| USA                      | 836    | 41.65 |
| England                  | 204    | 10.16 |
| Canada                   | 113    | 5.63  |
| Australia                | 59     | 2.94  |
| Germany                  | 46     | 2.29  |
| France                   | 38     | 1.89  |
| Netherlands              | 26     | 1.30  |
| Italy                    | 25     | 1.25  |
| India                    | 23     | 1.15  |
| Israel                   | 18     | 0.90  |
| Scotland                 | 17     | 0.85  |
| North Ireland            | 13     | 0.65  |
| P. R. China              | 13     | 0.65  |
| Switzerland              | 13     | 0.65  |
| Spain                    | 12     | 0.60  |
| Sweden                   | 12     | 0.60  |
| Denmark                  | 10     | 0.50  |
| Turkey                   | 10     | 0.50  |
| Japan                    | 9      | 0.45  |
| Wales                    | 9      | 0.45  |
| Czech republic           | 8      | 0.40  |
| Ireland                  | 8      | 0.40  |

| WoS country (mentioning) | Counts | %     |
|--------------------------|--------|-------|
| USA                      | 187    | 17.27 |
| England                  | 105    | 9.70  |
Results of “mentioning” analysis in WoS

Figure 3 below shows that mentions can be found in almost equal shares in the descriptor or title or abstract field. A more detailed view is given in Tables 6, 7, 8, 9, 10.

Figure 4 below gives an overview of the most used mentions for Galton in WoS.

### Table 5 continued

| WoS country (mentioning) | Counts | %   |
|--------------------------|--------|-----|
| France                   | 103    | 9.51|
| Canada                   | 66     | 6.09|
| Germany                  | 59     | 5.45|
| Australia                | 45     | 4.16|
| Russia                   | 35     | 3.23|
| Spain                    | 33     | 3.05|
| Sweden                   | 31     | 2.86|
| P.R. China               | 26     | 2.40|
| Israel                   | 21     | 1.94|
| Austria                  | 20     | 1.85|
| Netherlands              | 18     | 1.66|
| Japan                    | 18     | 1.66|
| India                    | 17     | 1.57|
| Bulgaria                 | 13     | 1.20|
| Taiwan                   | 12     | 1.11|
| Italy                    | 9      | 0.83|
| Mexico                   | 9      | 0.83|
| Scotland                 | 8      | 0.74|
| Belgium                  | 8      | 0.74|
| Wales                    | 8      | 0.74|

Fig. 3 Bibliographical occurrences of mentions
“Galton–Watson (branching) process” is the most used mention incl. “Galton–Watson tree” and “Bienayme Galton–Watson process” as sublevels of the term. Most of the mentions in WoS can also be found in encyclopaedias, such as “Galton’s problem” and “Galton–Watson process”, etc. Furthermore synonyms like Bean Machine, Quincunx or Galton box (instead of Galton board) and Galtonia (instead of Galtonia-Candicans) are included in “Others”. Even book titles can be rather mentioned than cited (Hereditary Genius with 15 overall mentions).

Table 6 Most mentioned as Descriptor in WoS (109 items)

| Rank | WoS descriptor                  | Items | %   |
|------|---------------------------------|-------|-----|
| 1    | Galton–Watson processes         | 48    | 46.15 |
| 2    | Galton–Watson trees             | 30    | 28.85 |
| 3    | Galtons fallacy                 | 11    | 10.58 |
| 4    | Galtons problem                 | 8     | 7.69  |
| 5    | Galtonia-Candicans              | 4     | 3.85  |
| 6    | Galton, Francis                 | 1     | 0.96  |
| 7    | Galton, Francis/heredity        | 1     | 0.96  |
| 8    | Galton–Board                    | 1     | 0.96  |

Table 7 Most mentioned as Author-Descriptor in WoS (208 items)

| Rank | Author descriptor               | Items | %   |
|------|---------------------------------|-------|-----|
| 1    | Galton–Watson process           | 62    | 29.81 |
| 2    | Galton–Watson tree or trees     | 45    | 21.63 |
| 3    | Galton–Watson branching process | 38    | 18.27 |
| 4    | Galton                          | 9     | 4.33  |
| 5    | Galton–Watson                   | 8     | 3.85  |
| 6    | Galton’s problem                | 7     | 3.37  |
| 7    | Galtonia candicans              | 5     | 2.40  |
| 8    | Galton’s board (Galton board)   | 5     | 2.40  |
| 9    | Bienayme Galton Watson process  | 5     | 2.40  |
| 10   | Galton’s data                   | 2     | 0.96  |
| 11   | Galton’s fallacy                | 2     | 0.96  |
| 12   | Galton Institute                | 1     | 0.48  |
| 13   | Galton Society                  | 1     | 0.48  |
| 14   | Galton statistic                | 1     | 0.48  |
| 15   | Galtonia                        | 1     | 0.48  |
| 16   | Galtonian inheritance           | 1     | 0.48  |
| 17   | Galtonian revolution            | 1     | 0.48  |
| 18   | Galton’s whistle                | 1     | 0.48  |
| 19   | Galton–Watson type process      | 1     | 0.48  |
| 20   | Galton–Watson forest            | 1     | 0.48  |
| 21   | Twin                            | 1     | 0.48  |
| 22   | Quincunx                        | 1     | 0.48  |
### Table 8  Most mentioned forms in title and abstract (88 items)

| In title and abstract (title) | Items | %   |
|-------------------------------|-------|-----|
| Galton–Watson processes       | 26    | 29.55 |
| Galton–Watson tree, family trees | 20   | 22.73 |
| Galton board, optical Galton board | 10  | 11.36 |
| Galton–Watson forest          | 3     | 3.41 |
| Galton’s problem              | 3     | 3.41 |
| Galtonia candidans            | 3     | 3.41 |
| Galton’s fallacy              | 2     | 2.27 |

### Table 9  Most mentioned forms only in title (417 items)

| Only in title | Items | %   |
|---------------|-------|-----|
| Galton–Watson process, branching process | 139  | 33.33 |
| Francis Galton | 87   | 20.86 |
| Galton problem | 38  | 9.11 |
| Galton       | 36   | 8.63 |
| Hereditary genius | 13 | 3.12 |
| Eugenics    | 8    | 1.92 |
| Galton–Watson tree | 7  | 1.68 |
| Galton data | 6    | 1.44 |
| Galtonia candidans | 6  | 1.44 |
| Galton whistle | 4  | 0.96 |
| Bienayme–Galton–Watson process | 3   | 0.72 |
| Galton’s board | 3  | 0.72 |

### Table 10  Most mentioned forms only in abstract (252 Items)

| Only in abstract | Items | %   |
|------------------|-------|-----|
| Galton–Watson (branching) process | 76   | 30.16 |
| Galton–Watson tree | 22  | 8.73 |
| Bienayme–Galton–Watson branching process (BGW) | 19  | 7.54 |
| Galton board | 11   | 4.37 |
| Galton regression | 9   | 3.57 |
| Galton’s problem | 9   | 3.57 |
| Galton-Pearson correlation coefficient | 7   | 2.78 |
| Galton’s Eugenics | 7   | 2.78 |
| Galton and Pearson | 5  | 1.98 |
| Galtonian conception of intelligence | 5   | 1.98 |
| Galton (as Person) | 4   | 1.59 |
| Galton’s quincunx | 4   | 1.59 |
| Galton Spearmann psychometrics | 3   | 1.19 |
| Galton, Pearson | 3    | 1.19 |
| Psychometrics of Galton | 3   | 1.19 |
### Results of the citation analysis

#### General results

**Most cited monographs**

The Tables 11, 12 gives an overview of Galton’s most cited monographs comparing their ranking position and number of citations in WoS, Scopus and Google Scholar. The correlation between the results obtained from the three different used data sources either including or excluding “Inquiries Human Faculty”¹ are shown in Table 13.

**Journal articles**

The table below gives an overview of Galton’s most cited journal articles (Top 40 in WoS) listing their number of citations in Scopus and Google Scholar for comparison (Table 14).

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1. “Inquiries Human Faculty” is an exception, since “some chapters were reprints, while others expanded on topics alluded to in earlier articles” (Gillham 2001, p. 207).
### Table 11  Citation analysis of Galton works in the three data sources

| Data source | Hits | Citations | Citing publications | Citations per publication | h-index | h-index without books |
|-------------|------|-----------|---------------------|---------------------------|---------|----------------------|
| WoS         | 1336 | 5891      | 2007                | 2.93                      | 25      | 21                   |
| Google Scholar | 240  | 7397      | n.a.                | 23.04                     | 30      | 26                   |
| Scopus      | n.a. | n.a.      | 2447                | 21                        |         |                      |

**Note:** Publish or Perish does not provide information about the number of citing publications but only the citation number.

The reference search in Scopus allows only to search in all the reference fields but not in each reference.

### Table 12  Most cited Galton’s books and book editions

| Rank | Title (abbreviation) | WoS | Google scholar | Scopus |
|------|----------------------|-----|----------------|--------|
|      |                      | Most correctly cited Ed. | Most cited Ed. | PY MCE | Cits (C) to all Eds | Rank C | Rank C |
| 1    | Inquiries Human Facu\(^a\) | 673 | 839 | 1883 | 1066 | 11 | 13 | 2 | 351 |
| 2    | Hereditary Genius     | 274 | 503 | 1869 | 912 | 1 | 2004 | 1 | 363 |
| 3    | Natural Inheritance  | 274 | 356 | 1889 | 387 | 2 | 657 | 3 | 156 |
| 4    | English Men Sci Thei | 114 | 222 | 1874 | 252 | 3 | 377 | 4 | 80 |
| 5    | Finger Prints         | 154 | 213 | 1892 | 250 | 4 | 338 | 5 | 74 |
| 6    | Memories My Life      | 54  | 111 | 1908 | 142 | 5 | 185 | 6 | 49 |
| 7    | Essays Eugenics       | 31  | 48  | 1909 | 55  | 7 | 85  | 7 | 33 |
| 8    | Narrative Explorer T\(^b\) | 18  | 28  | 1853 | 52  | 6 | 101 | 8 | 19 |
| 9    | Finger Print Directo  | 6   | 20  | 1895 | 24  | 9 | 21  | 14 | 1 |
| 10   | Art Travel Shifts Co | 6   | 8   | 1855 | 24  | 8 | 31  | 11 | 5 |
| 11   | Meteorographica Meth  | 8   | 12  | 1863 | 12  | 15 | 3   | 9  | 6 |
| 12   | Genie Vererbung\(^c\) | 6   | 10  | 1910 | 10  | 10 | 15  | 12 | 4 |
| 12   | Noteworth Families    | 9   | 10  | 1906 | 10  | 12 | 6   | 9  | 6 |
| 14   | Record Family Facult  | 3   | 3   | 1884 | 3   | 12 | 6   | 15 | 0 |
| 15   | Decipherment Blur S   | 3   | 3   | 1893 | 3   | 14 | 5   | 13 | 2 |

\(^a\) Also includes 24 citations for the alternative spelling “enquiries”; in Google Scholar only book chapters, but not the entire book cited

\(^b\) Also published and cited as “Tropical South Africa” (see Galton.org) and aggregated with “Narrative Explorer” cites

\(^c\) German translation of “Hereditary Genius” and explicitly cited with German title, could however be aggregated with the cites for the English title

### Table 13  Correlation of the results obtained for the most cited monographs in WoS, Scopus and Google Scholar with and without “Inquiries Human Faculty”

|                  | Corr WoS GS | Corr WoS Scopus | Corr GS Scopus |
|------------------|-------------|-----------------|----------------|
| Incl. Nr.1 (Inquiries) | 0.610       | 0.992           | 0.689          |
| Excl. Nr.1       | 0.990       | 0.995           | 0.994          |
| Rank | WoS | Title (abbreviation) | PY | Vol | Page | Correctly cited | Total cited WoS | Citations Google | Citations Scopus |
|------|-----|----------------------|----|-----|------|----------------|----------------|------------------|------------------|
| 1    |     | J Anthr I           | 1886 | 15  | 246  | 133            | 176            | 347              | 120              |
| 2    |     | BRAIN               | 1879 | 2   | 149  | 125            | 164            | 313              | 95               |
| 3    |     | J Royal Anthr I     | 1876 | 5   | 391  | 27             | 99             | 233              | 21               |
| 4    |     | Macmillans Magazine | 1865 | 12  | 157  | 75             | 81             | 218              | 39               |
| 5    |     | P Royal Soc         | 1888 | 45  | 135  | 67             | 80             | 157              | 27               |
| 6    |     | Nature              | 1880 | 21  | 252  | 76             | 76             | 2                | 55               |
| 7    |     | P Roy Soc           | 1879 | 29  | 365  | 65             | 68             | 88               | 26               |
| 8    |     | J Anthr I           | 1879 | 8   | 132  | 12             | 56             | 162              | 3                |
| 9    |     | Mind                | 1880 | 5   | 301  | 41             | 55             | 94               | 22               |
| 10   |     | Fortnightly Rev     | 1884 | 36  | 179  | 38             | 54             | 0                | 33               |
| 11   |     | Fortnightly Rev     | 1872 | 12  | 125  | 38             | 47             | 97               | 32               |
| 11   |     | Frazer's Magazine   | 1875 | 12  | 566  | 32             | 47             | 0                | 10               |
| 12   |     | Macmillans Magazine | 1865 | 12  | 318  | 41             | 45             | 2                | 33               |
| 13   |     | Nature              | 1878 | 18  | 97   | 40             | 41             | 0                | 3                |
| 14   |     | P Roy Soc London    | 1886 | 40  | 42   | 35             | 41             | 84               | 21               |
| 15   |     | P Roy Soc London    | 1897 | 61  | 401  | 32             | 39             | 40               | 15               |
| 16   |     | Nature              | 1880 | 21  | 494  | 17             | 27             | 2                | 22               |
| 17   |     | P Royal Soc         | 1871/2 | 19  | 393  | 21             | 25             | 44               | 16               |
| 18   |     | J Anthropol Instr   | 1875 | 4   | 138  | 2              | 24             | 159              | 28               |
| 19   |     | J Anthr I           | 1885 | 14  | 275  | 18             | 22             | 15               | 2                |
| 20   |     | Nature              | 1907 | 75  | 450  | 21             | 21             | 69               | 21               |
| 21   |     | Macmillans Mag      | 1871 | 23  | 353  | 19             | 20             | 34               | 2                |
| 22   |     | Nature              | 1877 | 15  | 492  | 19             | 19             | 0                | 5                |
| 23   |     | Mind                | 1887 | 12  | 79   | 15             | 19             | 3                | 2                |
| 24   |     | P Royal I Great Brit| 1877 | 8   | 282  | 18             | 18             | 0                | 12               |
| 25   |     | J Anthr I           | 1881 | 10  | 85   | 2              | 18             | 127              | 10               |
| Rank | WoS | Title (abbreviation) | PY | Vol | Page | Correctly cited | Total cited WoS | Citations Google | Citations Scopus |
|------|-----|----------------------|----|-----|------|-----------------|-----------------|-----------------|-----------------|
| 27   | Nature | 1907 | 75 | 414 | 17 | 17 | 34 | 10 |
| 27   | Nature | 1888 | 38 | 14 | 14 | 17 | 0 | 6 |
| 29   | Am J Sociol | 1904 | 10 | 1 | 14 | 15 | 94 | 13 |
| 29   | J Anthr I Great Brit | 1885 | 14 | 205 | 14 | 15 | 30 | 2 |
| 29   | P Royal Soc Lon | 1871/2 | 20 | 394 | 11 | 15 | 30 | 3 |
| 29   | Contemp Rev | 1875 | 27 | 80 | 11 | 15 | 0 | 7 |
| 33   | T Ethnological Soc L | 1865 | 3 | 122 | 9 | 14 | 29 | 6 |
| 34   | Philos Mag | 1875 | 49 | 33 | 11 | 13 | 19 | 6 |
| 34   | Nature | 1877 | 15 | 512 | 13 | 13 | 0 | 2 |
| 37   | Nature | 1877 | 15 | 532 | 12 | 13 | 2 | 6 |
| 37   | J Anthr I | 1890 | 19 | 27 | 0 | 12 | 25 | 1 |
| 37   | Nature | 1901 | 64 | 659 | 12 | 12 | 0 | 5 |
| 37   | J Anthr I | 1876 | 5 | 329 | 4 | 12 | 35 | 9 |
| 37   | Philos T Roy Soc Lon | 1891 | B182 | 1-23 | 7 | 12 | 8 | 2 |
| 41   | Biometrika | 1902 | 1 | 385 | 1 | 11 | 31 | 7 |
| 42   | Popular Sci Monthly | 1875 | 8 | 345 | 10 | 10 | 4 | 3 |
| 43   | Educational Times | 1873 | 17 | 2 | 10 | 21 | 1 |
| 44   | Cited Indirectly | | | | | | |

*a This famous paper is co-authored by H.W. Watson*
A comparison of the results obtained from WoS and from Google Scholar revealed that many of the references listed in the WoS Top 40 cannot be found amongst Google Scholar’s Top 40 (see Table 15).

Table 15 References from Google Scholar’s Top 40 not represented amongst WoS Top 40

| Rank | GS Rank | Title (abbreviation) | PY | Vol | Page | Corr. cited | Total citations | C WoS | C Google S | C Scopus |
|------|---------|----------------------|----|-----|------|-------------|----------------|-------|------------|----------|
| 12   | 25      | J Anthr Inst GB      | 1889 | 18 | 177 | 0 | 1 | 90 | 8 |
| 26   | 25      | Fraser’s Magazine    | 1873 | 7 | 116 | 0 | 2 | 26 | 2 |
| 28   | 28      | The North American Rev | 1890 | 150 | 419 | 0 | 0 | 25 | 5 |
| 32   |         | Nineteenth Century   | 1879 | ? | ? | * | * | 16 | 2 |
| 33   |         | Nature               | 1910 | 83 | 127 | 0 | 7 | 15 | 3 |
| 35   |         | Photographic NE 0417 | 1885 | 29 | 243 | 0 | 6 | 13 | 7 |
| 34   |         | Mind                 | 1894 | 3 | 362 | 1 | 3 | 12 | 0 |
| 37   |         | P Royal I Great Brit | 1879 | 161 | 4 | 5 | 11 | 2 |
| 37   |         | Synaesthesia: Classic and contemporary readings | 1880 | 43 | 4 | 8 | 11 | 8 |
| 37   |         | P Royal I Great Brit | 1882 | 29 | 729 | 0 | 0 | 11 | 0 |
| 40   |         | Psychological review | 1894 | 1 | 61 | 6 | 7 | 10 | 1 |
| 41   |         | Mind                 | 1890 | 15 | 373 | 0 | 10 | 9 | 3 |
| 41   |         | Nature               | 1895 | 52 | 174 | 0 | 0 | 9 | 0 |

Table 16 Most cited article titles

| Title | Rank WoS | Citations WoS | Rank GS | Citations GS | Rank Scopus | Citations Scopus |
|-------|----------|---------------|---------|---------------|-------------|------------------|
| Regression towards mediocrity in hereditary stature | 1 | 176 | 1 | 347 | 1 | 120 |
| Psychometric experiments | 2 | 162 | 2 | 313 | 2 | 95 |
| The history of twins, as a criterion of the relative powers of nature and nurture. | 3 | 156 | 3 | 237 | 5 | 34 |
| Hereditary talent and character | 4 | 126 | 4 | 220 | 4 | 57 |
| Visualised numerals | 5 | 121 | 8 | 131 | 3 | 85 |
| Composite portraits | 6 | 97 | 5 | 162 | >10 | 6 |
| Co-relations and their measurement | 7 | 80 | 7 | 157 | 9 | 27 |
| On the probability of the extinction of families | 8 | 75 | 6 | 159 | 8 | 28 |
| The geometric mean | 9 | 68 | >10 | 88 | 10 | 26 |
| Typical Laws of Heredity | 10 | 63 | >10 | 84 | 11 | 25 |
| Statistics of mental imagery | 11 | 55 | 10 | 94 | 12 | 22 |
| Measurement of character | 12 | 54 | 0 | 6 | 33 |
| Statistical inquiries into the efficacy of prayer | 13 | 47 | 9 | 97 | 7 | 32 |

Table 17 Correlation of the results obtained for the most cited journal articles in WoS, Scopus and Google Scholar

| | Correlation WoS GS | Corr WoS Scopus | Corr GS Scopus |
|-----------------|-------------------|----------------|----------------|
| Normal count    | 0.817             | 0.904          | 0.752          |
| Aggregated      | 0.912             | 0.761          | 0.697          |

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| Rank WoS | Inquiries Human | Hereditary Genius | Natural InheritanceE | English Men Sci Thei | Finger Prints | Memries My Life | Essays Eugenics | T Narrative Explores | Finger Print Directo | Art Travel Shifts | Meteorographica Meth | Noteworth Families | Record Family Facult | Decipherment Blur S |
|----------|----------------|------------------|---------------------|---------------------|--------------|----------------|----------------|----------------------|---------------------|----------------|-------------------|------------------|------------------|------------------|
| 1        | 1              | 2                | 3                   | 4                   | 5            | 6              | 7               | 8                   | 9                   | 10            | 11                | 12               | 13               | 13               |
|          | 1066           | 912              | 387                 | 252                 | 250          | 142            | 55              | 52                  | 24                  | 24            | 12                | 10               | 3                | 3                |

| Title                | Rank WoS | Obituary RS | Obituary Man | Comm. Paper -Corney | Website | Gillham’s Prologue 2001 | Pearson’s Contents | Balmer’s Contents | Bulmer’s Chronology 2003 |
|----------------------|----------|-------------|--------------|---------------------|---------|------------------------|-------------------|---------------------|------------------------|
| Inquiries Human      | 3        | 5           | 2            | 0                   | 1       | 1                      | 0                 | 0                   | 1                      |
| Hereditary Genius    | 1        | 1           | 1            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Natural InheritanceE| 2        | 3           | 2            | 2                   | 2       | 1                      | 1                 | 0                   | 1                      |
| English Men Sci Thei | 3        | 1           | 1            | 1                   | 1       | 0                      | 0                 | 0                   | 0                      |
| Finger Prints        | 4        | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Memries My Life      | 5        | 1           | 1            | 1                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Essays Eugenics      | 6        | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| T Narrative Explores | 7        | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Finger Print Directo | 8        | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Art Travel Shifts    | 9        | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Meteorographica Meth | 10       | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Noteworth Families   | 11       | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Record Family Facult | 12       | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Decipherment Blur S | 13       | 0           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |

| Britannica           | 3        | 6           | 1            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Wikipedia English    | 4        | 0           | 1            | 1                   | 0       | 1                      | 1                 | 1                   | 0                      |
| Wikipedia Deutsch    | 1        | 4           | 1            | 1                   | 1       | 2                      | 0                 | 2                   | 2                      |
| Poggendorff 2004     | 1        | 1           | 0            | 1                   | 0       | 1                      | 0                 | 1                   | 1                      |
| Larrousse             | 0        | 1           | 0            | 0                   | 0       | 1                      | 1                 | 0                   | 0                      |
| Colliers              | 1        | 2           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Espasa Calpe          | 1        | 1           | 1            | 1                   | 0       | 1                      | 1                 | 1                   | 1                      |
| Enciclopedia Italiana| 0        | 1           | 1            | 1                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Encyclopedia Americana| 0       | 1           | 1            | 1                   | 0       | 1                      | 1                 | 1                   | 1                      |
| Brockhaus 1989        | 0        | 1           | 0            | 0                   | 0       | 0                      | 0                 | 0                   | 0                      |
| Oxford DNB            | 1        | 0           | 2            | 0                   | 0       | 0                      | 0                 | 1                   | 0                      |
| Total                 | 22       | 41          | 20           | 13                  | 11      | 14                      | 5                 | 10                  | 12                     |
The results of the aggregation at title level and the corresponding Spearman correlation coefficients are shown in the Tables 16, 17:

Correlation analysis: citations vs. occurrences in other biographical sources

The results for Part A and Part B are shown in the Tables 18, 19, 20, 21.
Conclusions

Beyond doubt Francis Galton is a perfect choice for a bibliometric study. Doing research in many subject fields, showing versatile skills and being a prolific author he left a rich legacy for posterity. Galton’s versatility and interdisciplinary interest certainly allow a more extended view on the nature of citations as well as on the phenomenon of obliteration. His works are not only still, but increasingly cited or mentioned, which is proof for the timeliness of this outstanding scientist.

Challenges with citation analysis

Citation analysis of Galton’s most cited journal articles in WoS turned out to be more complicated in comparison to the analysis of the most cited books due to inaccurate citations.

These arise from

- typos in publication year (e.g. 1975 instead of 1875, 1879 instead of 1876, 1890 instead of 1899)
- articles published in journals with volumes covering two publication years (e.g. 1870–71) → either the one or the other publication year is cited
- Galton’s publication strategy: the publication of articles with the same title in multiple journals (e.g. “Typical laws of heredity”, “Theory of heredity”, “On blood-relationship”). The purpose was to target scientific experts as well as a broader public audience. A random check did not reveal obvious differences regarding the citation frequency of science vs. popular science articles.

In spite of the fact that the citation analysis of books is comparatively easier there are also challenges like dealing with different editions, different spellings or title changes.

The sources for citation analysis and their correlation

Without dispute WoS is the most suitable database for retrospective citation analyses according to their strict selection criteria and its enormous coverage (reaching back to 1900 = Century of Science). However, it is a matter of common knowledge that the “citations part” shows increasing signs of neglect and has such limited functionality (first authors only, no titles, no sorting, no grouping, no export options) in comparison to the “source part”. This is unfortunate, since this “reference part” once was the product’s key feature or unique selling proposition in the world of bibliographic databases. A well maintained “reference part” would be invaluable for studying the history of science, but unfortunately it has obviously become a step-child business.

The “reference part” of Scopus shows comparatively more usability. Scopus provides complete bibliographic information including the title which is extremely helpful in the citation data cleansing process and allows an impact estimation of the secondary (and not only of the primary) literature. Furthermore notes and footnotes of citing authors are displayed, which is interesting for historians. The downside of Scopus is the less comprehensive coverage in comparison to WoS including significant gaps. On the other side, it doesn’t allow a separate search in different fields of the reference, which hampers citation analysis considerably.

Google Scholar (in combination with “Publish or Perish”) is of limited utility due to its lacking sustainability, low reliability and non-disclosed selection criteria. It can only be

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seen as a complementary tool for the identification of potentially “lost” (= non-indexed in WoS or Scopus) publications especially in Arts and Humanities or in Social Sciences. It offers a large number of bibliometric indicators, however, most of them need to be proofed and/or corrected.

Scientometric analyses for historiometric purposes should rely on various databases—the more, the better. Therefore WoS, Scopus and Google Scholar perfectly complement one another, and the results obtained from the citation analyses of the most cited documents are overall consistent.

This is supported by the Spearman correlations which are very high for the three databases.

As already mentioned in a footnote in the Results part of this paper, Galton’s “Inquiries into human faculty” takes an exceptional position among his works. A considerable part of it has review character (either being reprint articles or expanding on former articles). Furthermore this book contains the first description of a new technology called “composite photography” and also introduces the term “eugenics” (his theory of improving the human race by controlling hereditary factors). Taking all this into consideration it is no wonder that “Inquiries” has so far resulted in more citations (and mentions) than any of Galton’s other books. That is why the correlation of the results obtained for the most cited monographs in WoS, Scopus and Google Scholar was calculated with and without this book.

Excluding “Inquiries” the correlation is excellent for all monographs. Otherwise the correlation becomes somewhat weaker between WoS and GS as well as between GS and Scopus.

The correlation of the results obtained for the most cited journal articles in WoS, Scopus and Google Scholar is best between WoS and Scopus for non-aggregated titles, and best between WoS and GS for aggregated titles.

Citation versus obliteration

Citation analysis is definitely appreciated as a useful tool to study the impact of the works of “giants”, especially by historians and biographers who by this means can easily detect publications with utmost impact. However, on its own it is too restrictive. The authors therefore recommend including the phenomenon of obliteration and thus detect eponyms.

They originate from “key words in title” or from author keywords, and gradually develop to official database descriptors. Unfortunately descriptors are only in general use since the 1950s and only available in WoS from 1990 onwards. Full text databases like JSTOR and Science Direct are therefore useful for the identification of eponyms in retrospective studies.

“Galton–Watson (branching) process” and “Galton–Watson trees” are the most used eponyms, followed by “Galton’s problem” and “Galton board”.

Whether scientists are (properly) cited or rather only mentioned might either depend on the respective subject area or on the country-specific cultural behaviour. Our findings suggests that obliteration is probably more common in subject areas like mathematics and statistics (the naming of formulas, processes, effects, etc.) than in e.g. psychology. Moreover the Americans (USA) seem to cite more often, whereas the Europeans tend to only mention.

According to our results Galton’s impact comprises of almost one-third (32%) obliteration by incorporation vs. the remaining two-thirds of citations (64%) and both (4%). Interestingly a recent paper on the “Nash Equilibrium” by John Forbes Nash (McCain and
McCain (2010) suggests quite the opposite proportion with two-thirds of articles where Nash is no more cited but only mentioned. Further studies of this kind will be necessary to make more well-grounded statements.

Citation vs. occurrence counts

In our study citation counts were furthermore compared to occurrence counts in obituaries, encyclopaedias and biographical indexes. As a result the most cited books and journal articles also turned out to be the most mentioned ones. The authors found an astonishingly positive correlation, and stumbling across single cases with low consistency reveal discrepancies otherwise missed. Except for Google Scholar the correlation between citations and mentions are higher for general obituaries, festschriften, encyclopaedias and dictionaries than for biographical texts. Furthermore occurrences retrieved in the “Table of Contents” or in the “Preface” sections seem to produce better correlations than those retrieved “anywhere in the full text”. Therefore it is recommended to weight the occurrences accordingly.

Citation analysis and the counting of occurrences in biographical sources, facilitated by the advent of electronic books, are important methods for the study of the history and sociology of science. Both support the retrieval of the most relevant or most influential works of giants or geniuses, and the combination of both approaches even better allows the unmasking of a “giant’s” publication strategy. The used methods can be regarded as complementary, bringing together the objective nature of citations and the subjective peer perspective of a biographer.

Certainly this kind of retrospective bibliometric analyses present an interesting and promising field of activity for librarians and information specialists.

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