# A Bibliometric Analysis of *Glottometrics*

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[Abstract] *Glottometrics*, one of the most authoritative journals in quantitative linguistics, has celebrated its 17th anniversary in 2017. In this paper, we conduct a bibliometric study of this journal. By statistical analysis of the basic data in all the 37 volumes published so far (2001-2017), we explore the publication profile, contributors, research content and major achievements, and citations based on self-built library and corpora. Results provide a glimpse of development and research status of quantitative linguistics, and suggestions for further improvements for this journal are also proposed.

[Keywords] *Glottometrics*; bibliometrics; quantitative linguistics

## 1. Introduction

As a sub-discipline of linguistics, Quantitative Linguistics (or QL) studies linguistic phenomena (properties, structures, processes) and their interrelations, whose methodology is characterized by quantitative methods and instruments ranging from mathematical tools to simulation and modeling (Best, 2006; Köhler, Altmann, & Piotrowski, 2005). The International Quantitative Linguistics Association (IQLA) and the International Conference on Quantitative Linguistics (QUALICO) are two most important international forums for quantitative linguists. With special focalization and profession, *Journal of Quantitative Linguistics* and *Glottometrics* are deemed as the most authoritative journals in QL.

Capturing the research status of an area, as is known, is the starting point of making strategic visions and conducting scientific research. In library and information science, bibliometrics is used to analyzing academic literature and evaluating research

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performance quantitatively, especially for universities, policy makers, research directors, librarians and researchers themselves. Nowadays in the Information Age, we have easy access to the research status and trends via content analysis and citation analysis. Databases (e.g. Web of Science, Scopus) and software (e.g. RefViz, CiteSpace, and Quosa) provide a more efficient way to detect burst terms, identify research fronts and visualize patterns and trends in scientific research.

As the names of *Glottometrics* and *Bibliometrics* imply, the shared suffix *-metrics* suggests a methodological similarity between them: measuring textual objects. In quantitative sense, it is natural to see that bibliometric method is employed in analyzing the literature in QL. Through quantitative analysis of 66 issues in *Journal of Quantitative Linguistics*, Chen and Liu (2014) investigated the objects, aims, methodologies as well as focuses, shifts and representative achievements of QL.

In this study, a bibliometric study of *Glottometrics* is conducted. The research questions of our study are: (1) What the publication profile of the journal is like? (2) Which authors, countries and regions, and affiliations contribute most to the journal? (3) What themes do these articles focus? Are there any shifts throughout the years? (4) Which of the source articles are cited most? What kinds of articles cite the journal? Which references occur most frequently in the bibliographies? We expect to provide a better overview of QL and suggestions for improving the academic impact of this journal.

The rest of this paper is organized as follows: Section 2 introduces the material and method used in this study; in Section 3, the results of bibliometric analysis are illustrated and discussed; the concluding remarks come in the final section.

# 2. Material and Method

*Glottometrics* (ISSN 1617-8351) is a scientific journal for the quantitative research of language and text published 2-3 times a year by RAM-Verlag in Germany. It has been indexed in Emerging Sources Citation Index (ESCI) since 2015, and then accepted for inclusion in Scopus since 2017. All issues are available as printed and electronic editions (pdf-files free download from its official homepage[2]). As for its aim and scope:

[2] URL: http://www.ram-verlag.eu/journals-e-journals/glottometrics/

"The aim of *Glottometrics* is quantification, measurement and mathematical modeling of any kind of language phenomena. We invite contributions on probabilistic or other mathematical models (e.g. graph theoretic or optimization approaches) which enable to establish language laws that can be validated by testing statistical hypotheses."[3]

The editorial board of *Glottometrics* consists of the following members: G. Altmann (Univ. Bochum, Germany), K.-H. Best (Univ. Göttingen, Germany), R. Čech (Univ. Ostrava, Czech Republic), F. Fan (Univ. Dalian, China), P. Grzybek (Univ. Graz, Austria), E. Kelih (Univ. Vienna, Austria), R. Köhler (Univ. Trier, Germany), H. Liu (Univ. Zhejiang, China), J. Mačutek (Univ. Bratislava, Slovakia), G. Wimmer (Univ. Bratislava, Slovakia), P. Zörnig (Univ. Brasilia, Brasilia). The majority of the editorial board is from European except for two Chinese linguists Liu and Fan from Asia.

Up to June 30th, 2017, the journal has published altogether 37 volumes (330 articles), covering a time span from the year 2001 to 2017, which is divided into four time slices of five years for better discussion: Period I (2001~2005), Period II (2006~2010), Period III (2011~2015) and Period IV (2016~2017).

Due to a lack of complete citation data of *Glottometrics* (2001~2017) in databases including Scopus and Web of Science, we come across difficulty in bibliometric analysis. Thus lots of efforts are made to fulfil the fields of the Endnote library in a manual way based on the information collected in the downloaded full texts. For the same reason, it is also difficult to visualize the patterns and trends in bibliometric instruments such as Web of Science and CiteSpace. Without the aid of these tools of high efficiency, in our study, items are counted in Microsoft Excel instead.

After downloading all the articles as the source material from the homepage of *Glottometrics*, we first build an Endnote[4] library of metadata in a manual way. Each record has 13 regular fields (namely, *type of article*, *author*, *year*, *title*, *volume*, *pages*, *keywords*, *abstract*, *country*, *affiliation*, *language*). Two additional fields, *viz.*, *research theme* and *research object* of a research article are also marked. Besides, the corpus of *keywords* and the corpus of *abstracts* are built respectively, each with four

[3] URL: http://www.ram-verlag.eu/wp-content/uploads/2012/09/Aims-and-Scope-Editorial-Board.pdf

[4] Endnote is a commercial reference management software package developed by Clarivate Analytics (URL: http://endnote.com/).

sub-corpora for different periods. Then, based on the counts of the fields above, we give a statistical analysis of the journal profile (publication frequency, type of work, length of article, and language) and contributors (authors, countries and regions, and affiliations). Additionally, research content, to be more specific, research themes and their diachronic changes are tracked by using AntConc to generate the wordlists and N-Gram lists for the corpora of keywords and abstracts. Next, the frequently occurring cited references and the most cited source references are counted and described statistically; a bibliometric profile for citing articles is given with the help of citation data from Web of Science and Google Scholar.

# 3. Results and Discussion

## 3.1 Publication Profile

### 3.1.1 **Publication frequency**

The first volume of *Glottometrics* was issued in 2001. Over the past 17 years, 37 volumes (330 articles) have been published so far (up to June, 2017). Its publication frequency over the years is shown in Figure 1:

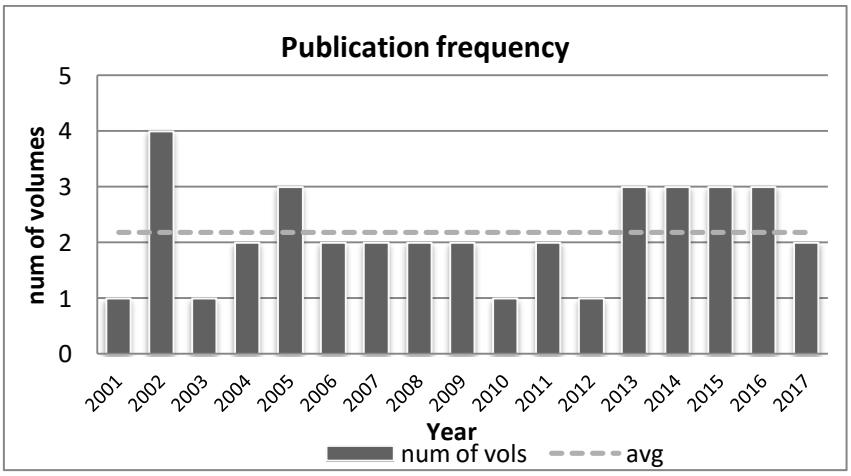


Figure 1 Volumes by year

Overall, the journal has kept its stated publication frequency of 2~3 times a year, except in 2001 (once), 2002 (4 times), 2010 (once) and 2012 (once).

The counts of articles in each volume are provided in Figure 2:

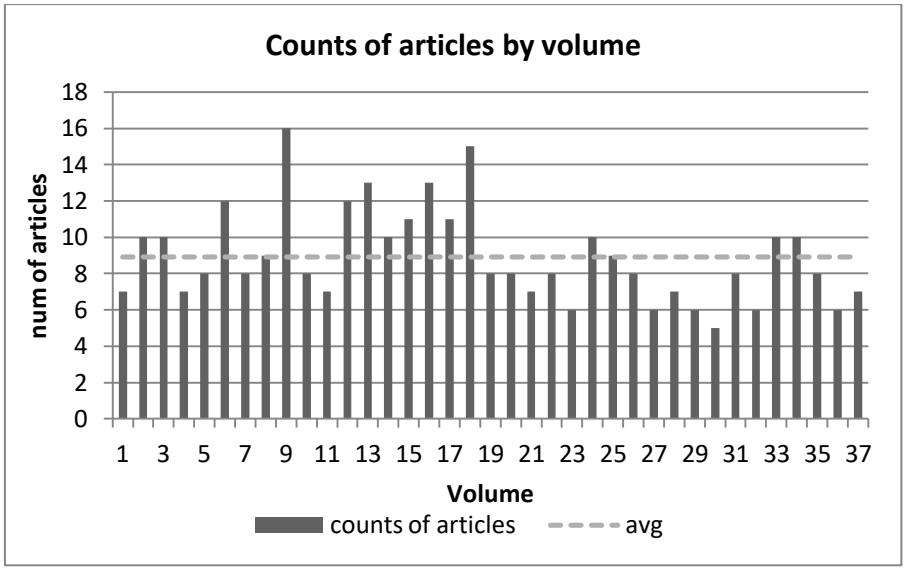


Figure 2 Articles by volume

As Figure 2 displays, the number of articles in a volume varies from a minimum of 7 to a maximum of 16, with an average of 9 over the years.

### 3.1.2 Types of Work

The articles of *Glottometrics* fall into six types: “general article”, “book review”, “history”, “bibliography”, “discussion” and “miscellanea”. Among them, “history” is a featured type of work in the journal which introduces important linguists and their achievements in the history of QL. Figure 3 and Figure 4 show the number and proportion of each type of work as well as their diachronic changes in number:

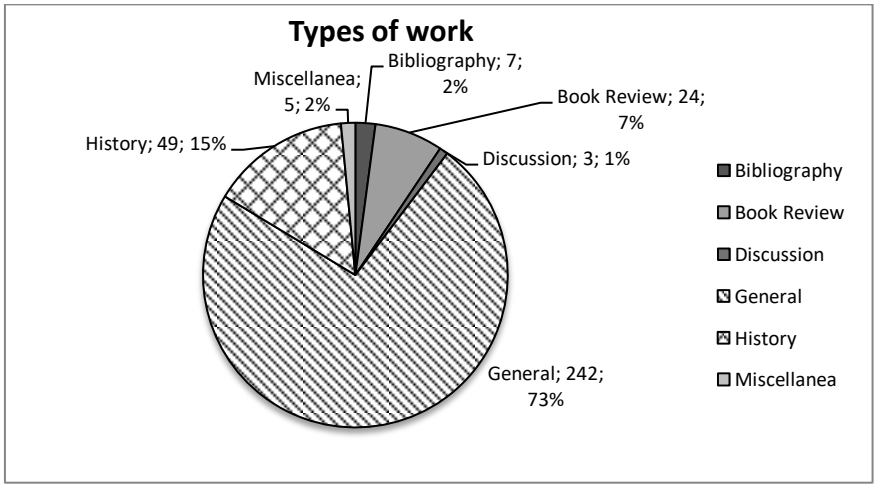


Figure 3 Type of work

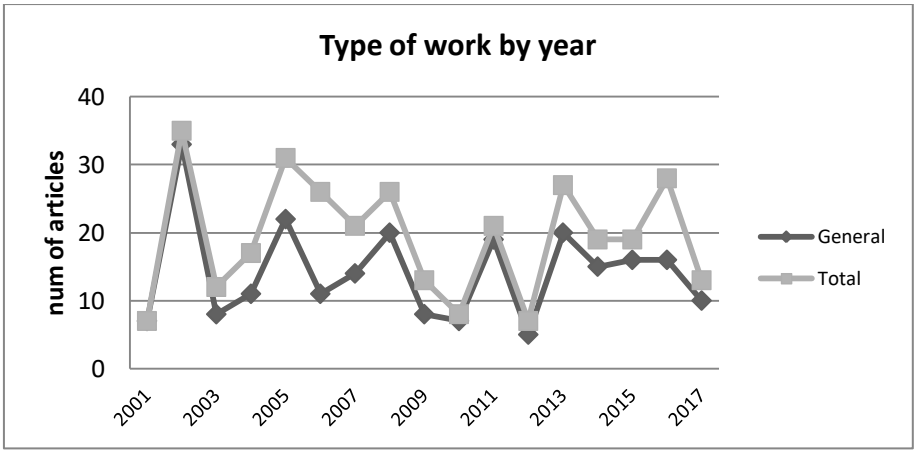


Figure 4 Type of work by year

As is shown in Figure 3 and Figure 4, general articles have kept the highest proportion in all types of articles over the years. Articles about history also take an important part especially from 2003 to 2010. The frequency of book reviews ever reached its peak in 2006 and 2013. Like other types of work, it appears unregularly in the timeline, accounting for just a small proportion.

### 3.1.3 Lengths of Article

The length of an article is also calculated as Table 1 displays:

Table 1 Pages per article of each type of work

| Type of work | Min (pages) | Max (pages) | Avg (pages/article) |
|---|---|---|---|
| Bibliography | 2 | 28 | 9 |
| Book Review | 1 | 10 | 4 |
| Discussion | 2 | 6 | 4 |
| General | 4 | 46 | 14 |
| History | 2 | 33 | 6 |
| Miscellanea | 1 | 13 | 6 |
| Total | 1 | 46 | 12 |

The length of an article varies greatly both within and across different types of work: an average length for all the articles is 12 pages; a book review or a miscellanea is as short as only one page, while a general article can reach as long as 46 pages.

### 3.1.4 Languages

All the submissions to *Glottometrics* are written in either English or German. Chronic changes in proportions of the two languages with and without the consideration of type of work are given in Figure 5 and Figure 6 respectively:

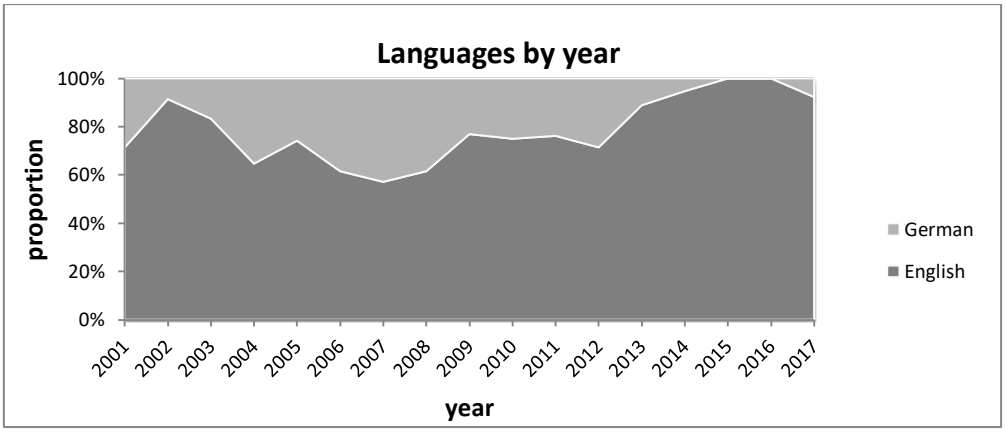


Figure 5 Languages by year

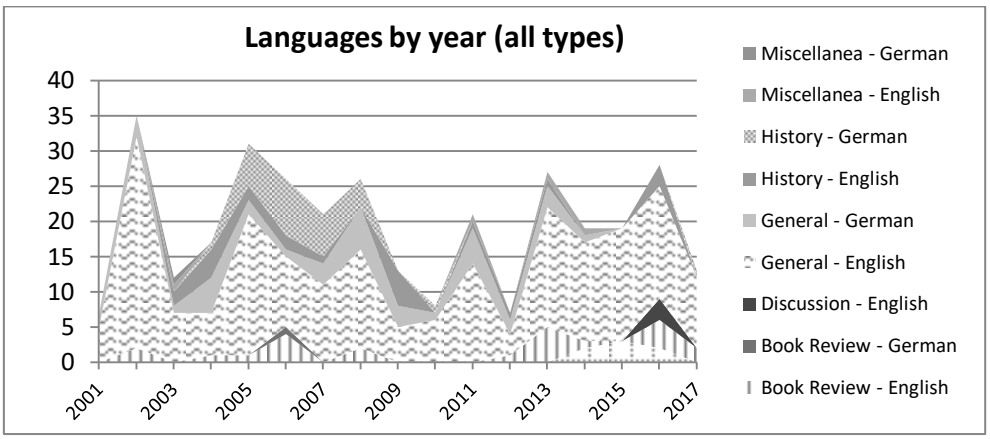


Figure 6 Languages by year and type

As is shown in Figure 5 and Figure 6, the majority of articles are written in English. During the first decade, German articles, especially book reviews and introductions to QL history, were commonly seen. After the year 2015 when the journal was indexed by ESCI, all the articles have been written in English.

## 3.2 Contributors

### 3.2.1 **Authors**

A rank of contributing authors is given in Figure 7 (among all the 201 authors, those who contribute less than three articles are not shown in this shortlist):

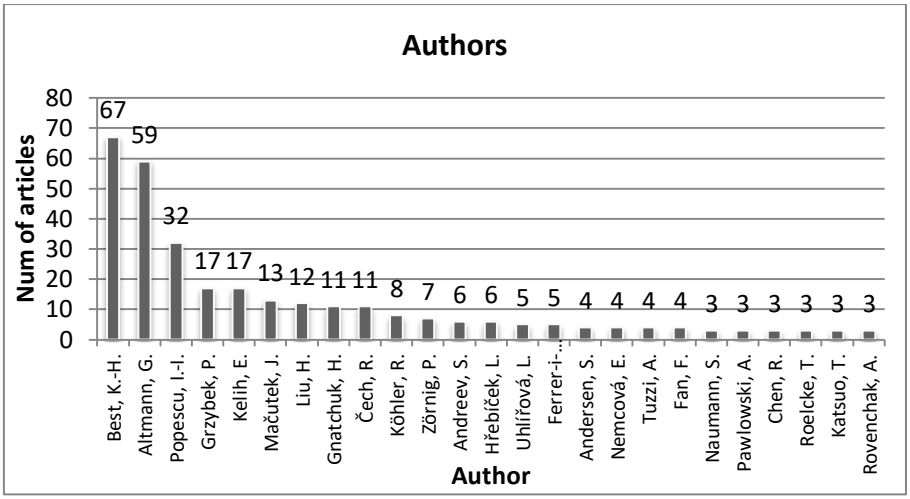


Figure 7 Authors (all types of work, freq.>=3)

Figure 7 clearly shows that Best and Altman are leading scholars, contributing more than 50 articles to *Glottometrics*. Other authors like Popescu, Grzybek, Kelih, Mačutek, Liu and Gnatchuk are quite productive as well.

When type of work is taken into consideration, results of counts of authors are shown in Figure 8 (for general articles), Figure 9 (for introductions to QL history) and Figure 10 (for book reviews) respectively:

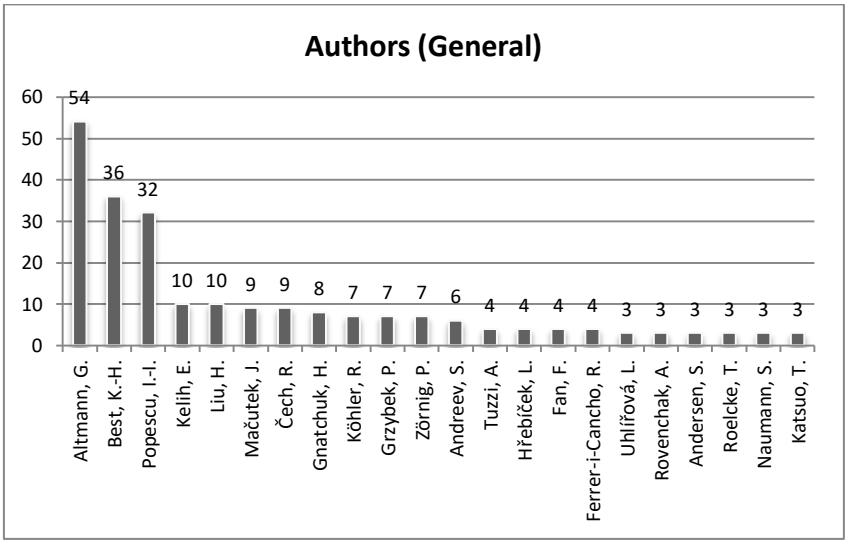


Figure 8 Authors (general articles, freq.>=3)

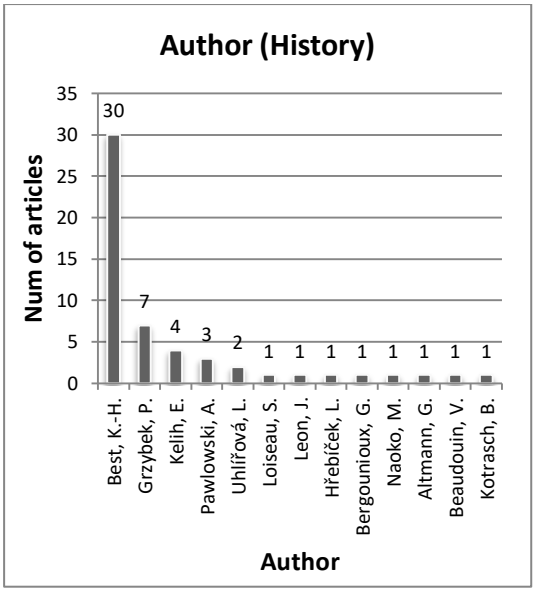


Figure 9 Authors (history)

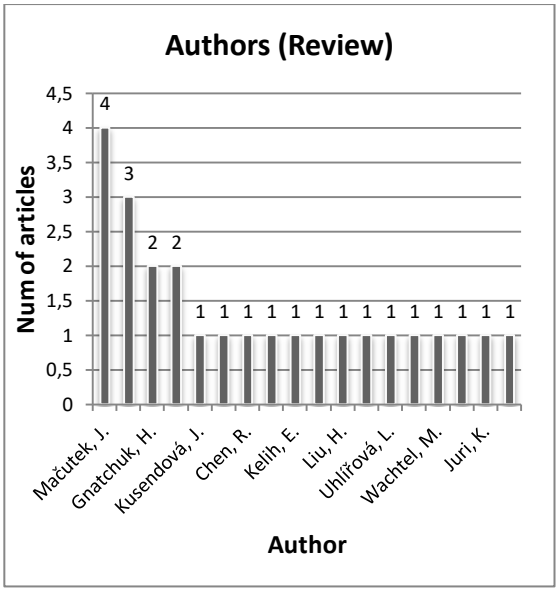


Figure 10 Authors (book reviews)

As for general articles, as is seen in Figure 8, Altmann and Best switch to the other's position, while the ranking order is more or less the same as that in Figure 7. Figure 9 and Figure 10 show that Best is the leading scholars in contributing introductions to history and and Mačutek in book reviews.

Co-authors are commonly seen within the network of research community. For example, Popescu and Altmann, Grzybek and Kelih, Best and Altmann, have kept their long-time cooperation.

### 3.2.2 Countries and Regions

All the published 330 articles are written by 201 authors from 25 countries and regions. A pie chart of these countries and regions' contributions is given in Figure 11:

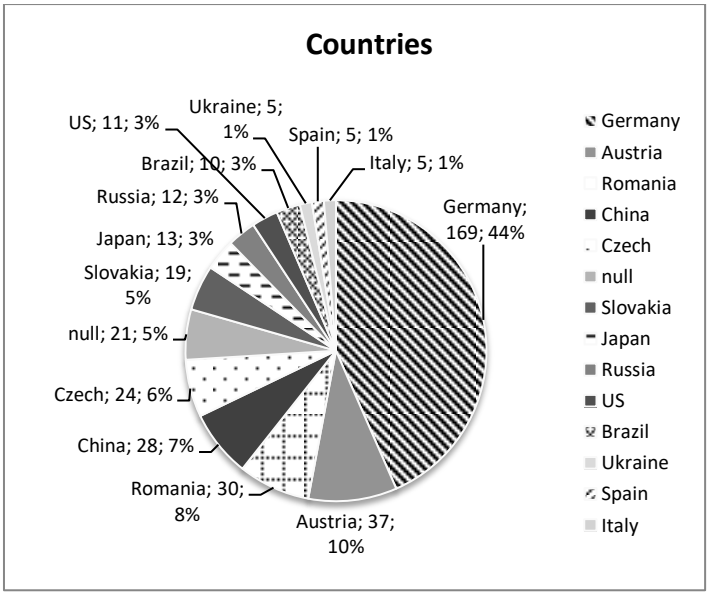


Figure 11 Countries and regions

(Note: "Null" means information missing in this field.)

It is seen that the contributing countries and regions are mainly from Europe, US, China and Japan. Germany takes the champion position (44%), followed by Austria (10%). Romania (8%). China (7%), Czech (6%) and Slovakia (5%) fall between the scope between 5% and 10%. The following countries also have contributions to the journal (<=4%, not displayed in Figure 11): Japan, Russia, US, Brazil, Ukraine, Spain, Italy, Canada, UK, German, India, Egypt, Belgium, South Korea, Argentina, Iran, Poland, France and Sweden. Of course, it should be noted that there is still 11% missing data.

For the general articles only, the chronic changes in the counts of countries and regions can be seen from Figure 12:

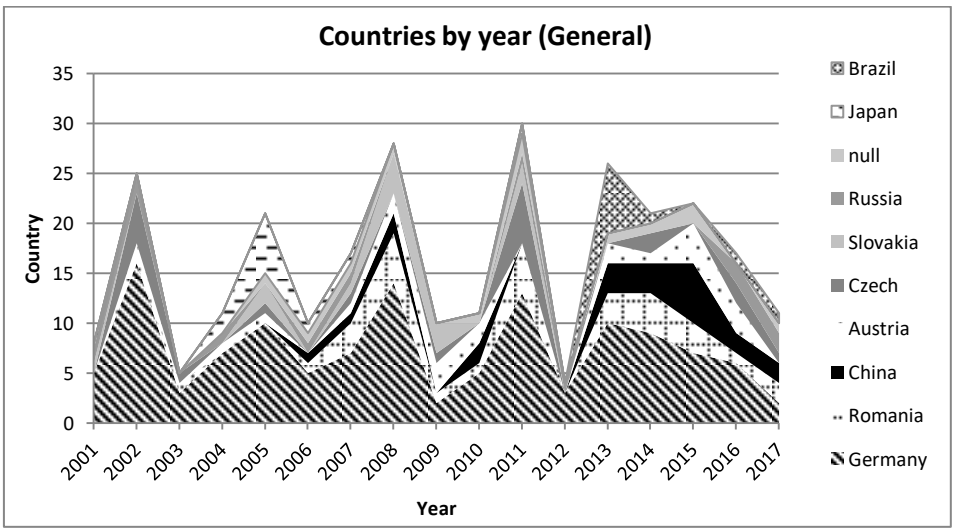


Figure 12 Countries and regions by year (general articles)

As is shown, German has maintained its overwhelming influence in QL research throughout the world. In recent years, the emergence of non QL-tradition countries and regions including China, Brazil and Russia is clearly seen. Japan reached a climax in 2005 and then undergoes a decline afterwards.

### 3.2.3 Affiliations

As part of metadata of a citation, counts of affiliations are given in Figure 13:

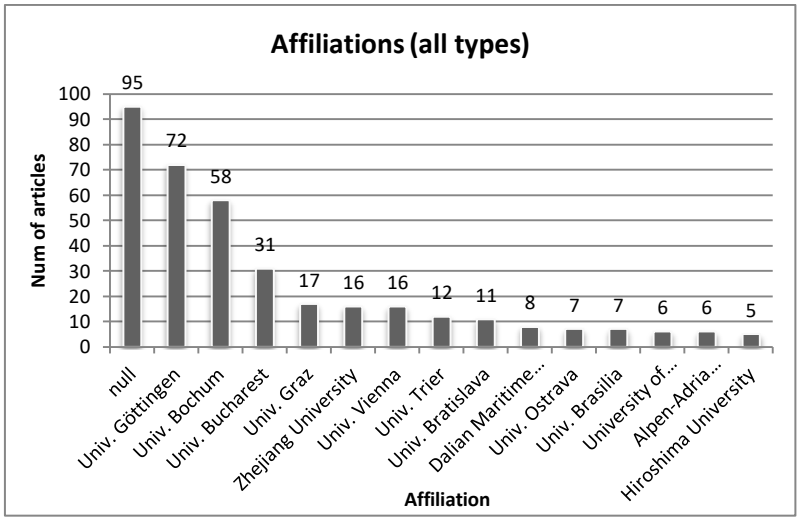


Figure 13 Affiliations (freq.>=5)

(Note: "Null" means information missing in this field.)

In Figure 13, the information of affiliations is missing in quite a number of articles in *Glottometrics*. According to our limited statistics about the rest, Univ. Göttingen contributes most to the journal, followed by Univ. Bochum and Univ. Bucharest. The results are directly related to the authors. For instance, Univ. Göttingen, top 1 on the rank, is the institution to which productive authors like Best K.-H. is affiliated.

Changes of affiliations for general articles over the years are shown in Figure 14:

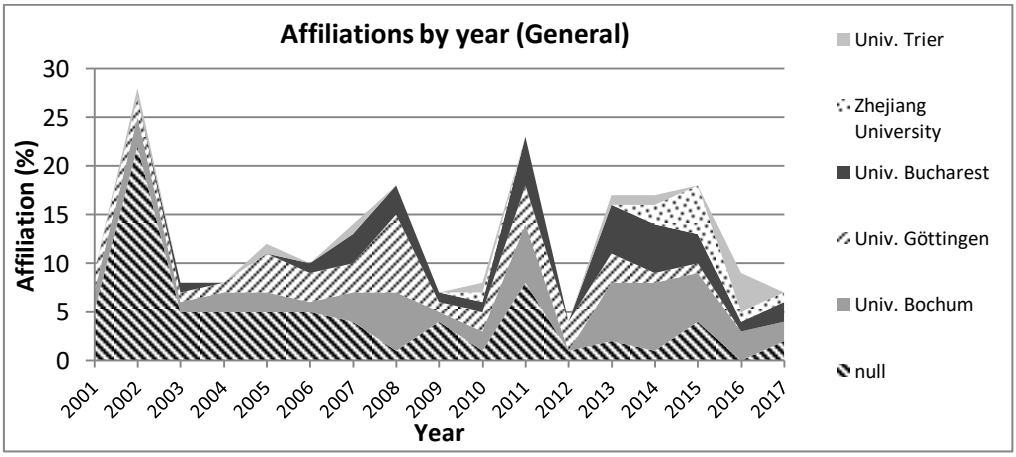

Figure 14 Affiliations by year (general articles)

It is shown in Figure 14 that Univ. Göttingen sees an obvious rise and fall at the turning point of the year 2008. Contributions of Univ. Bochum and Univ. Bucharest fluctuate greatly over the years, and those of Zhejiang University and Univ. Trier have a dramatic increase in recent years.

### 3.2.4 Funding

Funding for research projects maintains and develops vigorous research activities by providing material foundation. In an article, funding acknowledgements provide a better context and confirmation of significance of research. Of all the 330 articles, there are 33 specifying their funding acknowledgements. The titles of articles funded and funding organizations as is displayed in Table 2:

Table 2 Articles with funding acknowledgements

| No. | Title of aticle | Funding | Country |
|---|---|---|---|
| 1 | An Optimization Model of Global Language Complexity | the Research Fund of CEMA University | Argentina |
| 2 | Entropy of a Zipfian Distributed Lexicon | the Brazilian agencies CNPq and FAPEMIG | Brazil |
| 3 | The Impact of Code-switching on the Menzerath-Altmann Law | Zhejiang Gongshang University | China |
| 4 | A Quantitative Investigation of the Genre Development of Modern Chinese Novels | the National Social Science Foundation of China | China |
| 5 | Golden section in Chinese Contemporary Poetry | the National Social Science Foundation of China | China |
| 6 | Comparison of vocabulary richness in two translated Hongloumeng | the National Social Science Foundation of China | China |
| 7 | Probability distribution of interlingual lexical divergences in Chinese and English: (dao) and said in Hongloumeng | the National Social Science Foundation of China | China |
| 8 | A diachronic study of Chinese word length distribution | the National Social Science Foundation of China | China |
| 9 | How do Local Syntactic Structures Influence Global Properties in Language Networks? | the National Social Science Foundation of China, the Communication University of China | China |
| 10 | Adnominal Constructions in Modern Chinese and their Distribution Properties | the National Social Science Foundation of China | China |
| 11 | Quantitative Studies in Chinese Language | the National Social Science Foundation of China | China |
| 12 | Mastering the measurement of text's frequency structure: an investigation on Lambda's reliability | the Fundamental Research Funds for the Central Universitites and the MOE Project of the Center for GDUFS | China |
| 13 | Quantitative Aspects of RST Rhetorical Relations across Individual Levels | Department of Education of Zhejiang Province, China and the | China |

| | | | |
|---|---|---|---|
| | | National Social Science Foundation of China | |
| 14 | Vocabulary richness in Slovak poetry | the Czech Science Foundation | Czech |
| 15 | Fractal analysis of Poe's Raven | the Council of Czech Government | Czech |
| 16 | Word frequency and position in sentence | Project 1 ET 1011 20413 (Academy of Sciences of the Czech Republic) | Czech |
| 17 | Four reasons for a revision of the transitivity hypothesis | GAČR (Czech Science Foundation) | Czech |
| 18 | Word form and lemma syntactic dependency networks in Czech: a comparative study | GAČR (Czech Science Foundation) | Czech |
| 19 | Hidden communication aspects in the exponent of Zipf's law | the Future and Emerging Technologies program | Europe |
| | A psycholinguistic application of synergetic linguistics | the European Union in the framework of a Marie Curie Intra-European Fellowship | Germany |
| 20 | Predicting Attachment of the Light Verb –suru to Japanese Two-kanji Compound Words Using Four Aspects | the Japan Society for the Promotion of Science | Japan |
| 21 | A Database of Two-Kanji Compound Words Featuring Morphological Family, Morphological Structure, and Semantic Category Data | the 21st Century COE Program | Japan |
| 22 | Constructing a Large-Scale Database of Japanese Word Associations | the 21st Century COE Program | Japan |
| 23 | New Kango of the early Meiji era: Their survival and disappearance from Meiji to the present | "Research Fellowships of the Japan Society for the Promotion of Science for Young Scientists" and "Grant in Aid for JSPS Fellows" | Japan |
| 24 | Zum Problem der Entstehung des syllabotonischen Versmaßsystems im europäischen Vers | dem Deutschen Akademischen Austauschdienst (DAAD) und in den Jahren 2003–2004 von dem Russischen Bildungsministerium | Russia |
| 25 | Some statistical investigations concerning word classes | VEGA | Slovakia |
| 26 | Discrete distributions connected by partial summations | VEGA | Slovakia |
| 27 | Distribution of complexities in the Vai script | VEGA | Slovakia |
| 28 | Some problems of musical texts | VEGA | Slovakia |
| 29 | Confidence intervals and tests for the h-point and related text characteristics | VEGA | Slovakia |
| 30 | Runes: complexity and distinctivity | VEGA | Slovakia |
| 31 | Some properties of the Ukrainian writing system | VEGA | Slovakia |
| 32 | Towards a model for rank-frequency distributions of melodic intervals | VEGA | Slovakia |
| 33 | The Meaning-Frequency Law in Zipfian Optimization Models of Communication | APCOM from MINECO (Ministerio de Economía y Competitividad), the grant 2014SGR 890 (MACDA) from AGAUR (Generalitat de Catalunya) | Spain |

Table 2 shows the funding sources are mainly from government, foundations and

professional organizations. In countries like China and Czech, the investigation in education and research is commonly seen as part of governmental strategy. For instance, studies of Liu's team in recent years have been largely supported by the National Social Science Foundation of China. All confirms the significance of QL beyond a researcher's personal interest and concern.

At the same time, the proportion of articles funded is much lower than those of the top linguistics journals shown in the Appendix (e.g. *Applied Linguistics*: 96.38%; *Journal of Memory and Language*: 66.67%; *Bilingualism-Language and Cognition*: 78.50%). Admittedly, research funding concerns factors of social, economic and political aspects. Viewed from the sub-discipline itself, the low funding rate may result from a relatively low attention in the linguistic circle. QL research still needs more support in different forms, in theory and application on the way to embrace a more promising scenario.

## 3.3 Research Content

### 3.3.1 **Keywords**

The information of in this field of 24 (10%) articles is missing. Keywords of the rest 218 articles (90%) are extracted from the self-built corpus. Results covering the time span of 2001~2017 are given in Table 3:

Table 3 A wordlist of keywords in general articles (2001~2017, freq.>=5)

| Rank | Freq. | Word |
|---|---|---|
| 1 | 25 | German |
| 2 | 21 | word length |
| 3 | 21 | Zipf's law |
| 4 | 16 | English |
| 5 | 14 | diversification |
| 6 | 13 | Piotrowski law |
| 7 | 12 | entropy |
| 8 | 11 | Russian |
| 9 | 11 | sentence length |
| 10 | 10 | word frequency |
| 11 | 9 | Chinese |
| 12 | 8 | borrowings |
| 13 | 8 | rank-frequency distribution |
| 14 | 7 | arc length |
| 15 | 7 | corpus |
| 16 | 7 | h-point |
| 17 | 7 | ranking |
| 18 | 6 | lamda |
| 19 | 6 | Slovak |
| 20 | 6 | stratification |
| 21 | 6 | text |
| 22 | 5 | rank frequency |

| | | |
|---|---|---|
| 23 | 5 | repeat rate |
| 24 | 5 | vocabulary richness |
| 25 | 5 | Zipf |

Aided by AntConc, we get four wordlists of keywords in different periods from the four sub-corpora in Table 4:

Table 4 Wordlists of keywords in general articles in four periods (freq.>=3)

| Period I | Period II | Period III | Period IV |
|---|---|---|---|
| Zipf's law | German | entropy | Russian |
| entropy | word length | stratification | compounds |
| German | English | word length | distance |
| ranking | diversification | Chinese | English |
| economy | Russian | diversification | German |
| information | h-point | German | Pushkin |
| language change | sentence length | lambda | |
| Piotrowski law | Zipf's law | rank-frequency distribution | |
| word frequency | arc length | English | |
| word length | borrowings | Piotrowski law | |
| | Chinese | arc length | |
| | Piotrowski law | binomial distribution | |
| | word classes | borrowings | |
| | word frequency | corpus | |
| | | distribution | |
| | | polysemy | |
| | | rank frequency | |
| | | repeat rate | |
| | | sentence length | |
| | | translation | |
| | | verse length | |
| | | vocabulary richness | |
| | | word frequency | |

Table 3 and Table 4 show the focuses and shifts of QL research over the years. The keywords including *Zipf's law*, *Piotrowski law*, *word length*, *word frequency*, *rank*, *rank-frequency*, *rank-frequency distribution* are shared by all the periods. It indicates that studies on laws have been canonical. Another group of key words like *German* are related to the languages being studied or as source of material. The popularity of *German* and *English* never fades, and *Chinese* and *Russian* also catch the eyes of researchers in the past decade. Chronically, the first period focuses on system and laws. In Period II, studies on words (such as *word length*, *word class*) are emphasized, together with *borrowing*, *arc length*, *sentence length* and *diversification*, which are still popular in Period 3. Meanwhile, keywords concerning translation and literature see an increase in the third and fourth periods.

### 3.3.2 Abstracts

A wordlist of the abstracts (1 abstract missing) is provided below in Table 5:

Table 5 A wordlist of abstracts in general articles (2001~2017, freq.>=15)

| | | | |
|---|---|---|---|
| distribution | kanji | sentence | Piotrowski |
| word | English | complexity | size |
| law | linguistic | classes | theory |
| length | Altmann | lexical | entropy |
| frequency | semantic | corpus | laws |
| text | frequencies | structure | speech |
| texts | functions | Japanese | tests |
| words | vocabulary | modern | diversification |
| language | rank | features | information |
| Zipf | dependency | statistical | lengths |
| data | properties | theoretical | Russian |
| model | quantitative | logistic | syntactic |
| distributions | hypothesis | power | type |
| German | linguistics | system | units |
| languages | Chinese | indicators | |

A list of N-Grams (N: 2~5) of abstracts are also extracted from this corpus. After manual selection, results are shown in Table 6:

Table 6 An N-Gram list of abstracts in general articles (2001~2017, freq.>=10)

| | |
|---|---|
| word length | rank frequency distribution |
| the distribution | natural languages |
| rank frequency | poisson distribution |
| frequency distribution | power law |
| piotrowski law | word classes |
| sentence length | compound words |
| logistic law | the logistic law |
| parts of speech | word frequency |
| frequency distributions | |

Table 7 illustrates differences and changes in four periods in a more specific way:

Table 7 Wordlists and N-Grams lists of abstracts in general articles in four periods

| Period | Wordlist (freq.>10) | N-Grams (freq.>5) |
|---|---|---|
| Period I | law, Zipf, word, frequency, distribution, Kanji, text, language, data, number, length, German, model, Japanese, linguistics, semantic, structure, compound, term, lexical, network, property, quantitative | Zipf's law, compound word, Kanji compound word, word length, kanji stroke, natural language, word class, word frequency |
| Period II | distribution, law, word, frequency, language, Zipf, text, length, kanji, data, German, model, property, Japanese, rank, semantic, linguistics, | the distribution, word length, in German, rank frequency, natural language, power law, compound word, poisson distribution, sentence length, |

| | | |
|---|---|---|
| | analysis, statistical, lexical, model, natural, order, sentence, structure, English, modern, power, quantitative, theoretical, class, hypothesis, logistic, network, compound, letter, speech, system, unit, Altman, empirical, feature, Piotrowski, size, test | frequency distribution, parts of speech, frequency distribution, kanji compound word, the Piotrowski law, kanji stroke, language change, the h point, word class, word frequency |
| Period III | length, word, distribution, frequency, text, English, language, law, function, vocabulary, Chinese, model, data, Altman, German, complexity, hypothesis | word length, frequency distribution, content word, length distribution, word length distribution, rank frequency distribution |
| Period IV | dependency, text, number, distribution, word, Altmann, frequency, length, speech, compound, corpus, function, lambda, language, complexity, information, type, vocabulary, crossing, distance, model, Popescu | code switching, inaugural address, number of crossings |

Table 5~Table 7 provides us additional information about the developments of QL. In line with the findings from the study of keywords, word length and frequency studies have gone along with the development of QL. Words like *language*, *text*, *word*, *vocabulary*, *lexical*, *semantic* on the list imply the objects and material of investigation in QL as a branch of linguistics. Others like *empirical*, *hypothesis*, *law*, *model*, *data* and *test* indicate that QL research observes the paradigm of scientific research. And *frequency* and *lamda* are related to the indices of QL. In terms of shifts in different time, Japanese Kanji forms an issue for a number of studies especially in Period I and II. The third period still concerns quantitative studies on word level combined with textual research. Recently, researchers start to turn their eyes to syntactic and textual levels.

### 3.3.3 Objects Studied

Combined with the quantitative analysis of two corpora, we summarize and mark the object being studied in each general article. The objects can be classified into nine themes in reference to the taxonomy of linguistics:

(1) System: laws in language systems, properties of a system (economy or symmetry), relations of aspects (levels or elements) within a system from a macro view;

(2) Phonology and phonetics: phonemes, prosody in literary works, sound symbolism;

(3) Morphology, lexicology and lexicography: word class, word frequency, word length, type-token relation, entropy, polysemy and synonym; affix, borrowing and compounding;

(4) Sentence and syntax: sentence length, syntactic complexity, syntactic network;

(5) Semantics and pragmatics: lexical semantics, information content in communication;

(6) Text: text genre and style, translation, text processing;

(7) Dialectology, typology, diachronics, psycholinguistics, language learning, computational linguistics;

(8) Script: script complexity, grapheme-phoneme relationship, letters;

(9) Others: overviews of QL, introductions to the scholars, etc..

We calculate the number of articles falling into the themes above, proportions given in Figure 15:

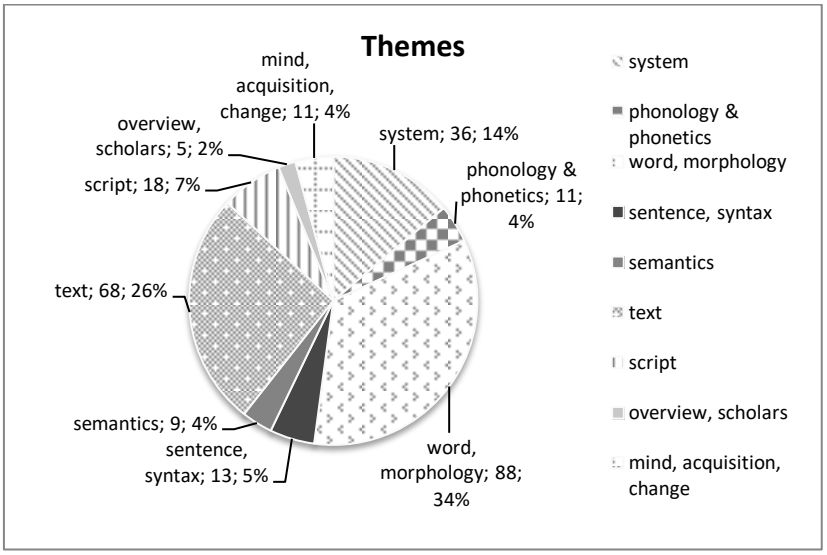


Figure 15 Proportions of research themes in general articles

As Figure 15 shows, 34% of general articles focus on the exploration of words and morphology. Textual research also constitutes approximately one third (26%), followed by studies on system (14%). Other themes such as scripts, sentence and syntax take up only a minor part.

Figure 16 further illustrates the percentage changes of the research themes over the years:

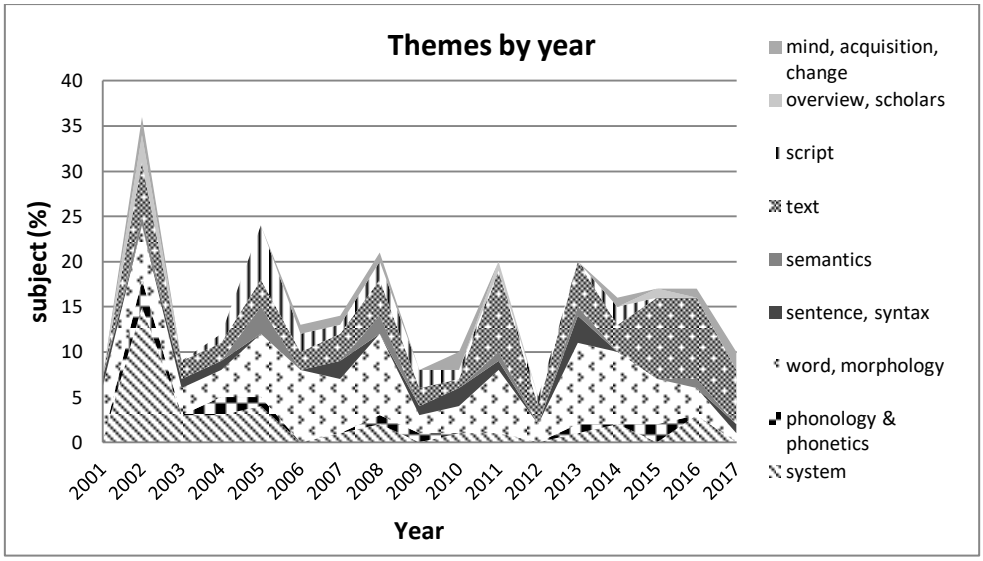


Figure 16 Proportions of research themes by year in general articles

As is illustrated, “word and morphology” has constantly attracted researchers’ attention throughout the years. Another canonical theme is “text”, which gradually outnumbers “word and morphology” recently. Other themes have been focused by a small part of articles.

Among enormous academic literature, a hot topic emerges when it has been focused by a number of articles during a certain time span. Hot topics are usually identified with citation analysis tools by detecting burst terms. In our study, we do manual analysis instead, setting the minimum frequency of appearance at 3 in two consecutive years for a hot topic.

Results show that there are 8 hot topics: law, word frequency, word class, word length, borrowing, indicator, text genre and style. Half of them deal with words and their ways of combination. Specifically, some representative studies of each hot topic are given:

(1) Law: the application and modification of Zipf’s law (Adamic & Huberman, 2002; Reinhard Köhler, 2002; Popescu, 2003; Wheeler, 2002)(Adamic & Huberman, 2002; Kromer, 2002; Li, 2002; Popescu, 2003; Wheeler, 2002), power law (Hřebíček, 2003; Reinhard Köhler, 2002), etc.;

(2) Word frequency: aspects (Popescu & Altmann, 2006), relations to word order and position (Fenk-Oczlon & Fenk, 2002; Uhlířová, 2007), etc.;

(3) Word class: mathematic and statistical investigation (Vulanović & Canton, 2008; Wimmer & Altmann, 2001), diversification (Best, 2013; Tuzzi, Popescu, & Altmann, 2011), dynamics (Popescu, Best, & Altmann, 2007), investigations into part

of speech (including adnominal, adverbial, verb, noun, adjective), etc.;

(4) Word length: lengths of linguistic units(Best, 2011a); its distribution (Best, 2011b; Chen & Liu, 2014; Wang, 2013; Wilson, 2003), relations to sentence length (Fan, Grzybek, & Altmann, 2010), etc.;

(5) Borrowing: borrowing and Piotrowski law (Best, 2005, 2015)(too many to list here);

(6) Indicator: arc length (Popescu, Mačutek, & Altmann, 2008; Popescu, Zörnig, & Altmann, 2013; Zörnig, 2017), Lamda (Poiret & Liu, 2017; Popescu & Altmann, 2015);

(7) Text genre: quantitative analysis of a certain genre such as speech (Kubat & Čech, 2016), poem (Pan, Qiu, & Liu, 2015), musical texts (Mačutek, vehlíková, & Cenkerová, 2011; Martináková, Popescu, Mačutek, & Altmann, 2008), etc.;

(8) Text style: stylistic analysis of literary work (Andreev, 2016; Bortolato, 2016; Levickij & Hikow, 2004).

Changes of the hot topics above in frequency are shown in Figure 17:

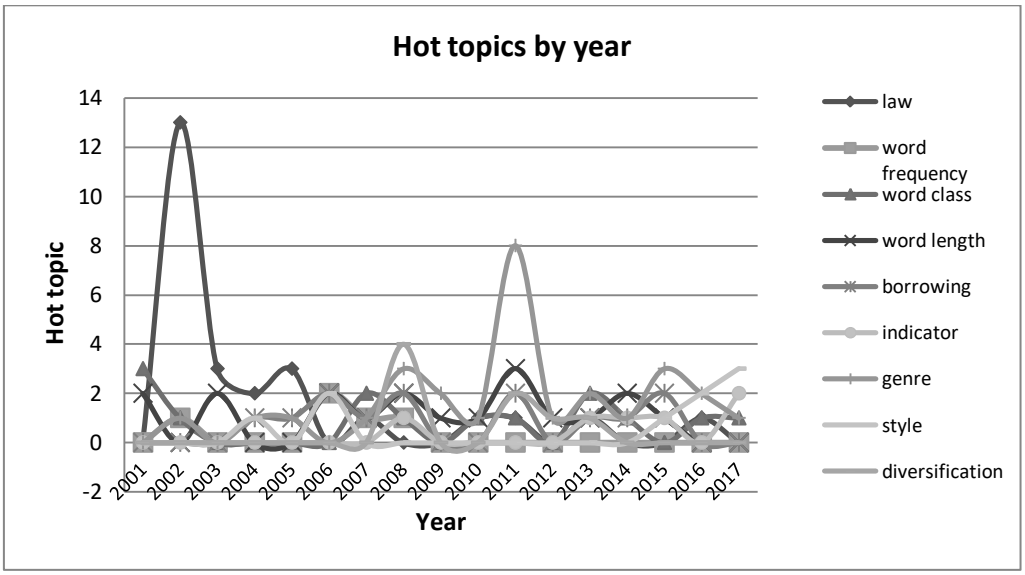


Figure 17 Hot topics by year in general articles

As Figure 17 shows, a conspicuous rise of “law” reached to a peak in 2002, becoming the hottest topic of that year, the popularity of which extends to the following years. Genre studies also witnessed an obvious rise in 2011.

## 3.4 Citations

From the bibliometric view, references in a citation web are connected by two kinds of citation relations: citing and cited. Next citing articles and the cited

references of the 330 source articles in *Glottometrics* are analyzed respectively.

### 3.4.1 Source Articles

In the databases such as Web of Science and Google Scholar, citation activity is easily tracked. Unlike SCIE and SSCI, Journal Impact Factor[5] metrics for journals covered in ESCI are not calculated. Therefore, times cited is used here as one of the bibliometric indices to measure the academic influence of an article in the scientific community.

According to Web of Science, there are altogether 168 (22.6%) of 330 source articles in *Glottometrics* cited in the dataset. In terms of documents cited, it would have been at 54th percentile in the linguistics journals in InCites[6]. The rank-frequency relation is given in Figure 18:

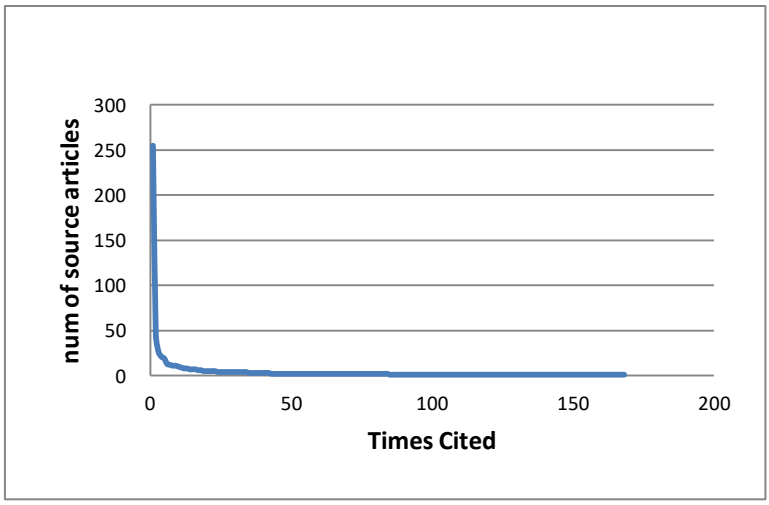


Figure 18 The rank-frequency curve for source articles according to Web of Science

As Figure 18 shows, all the 330 documents of the journal have 743 total cites in Web of Science, with an average of 2.25 cites per document and an *h*-index[7] of 10. In terms of times cited per document only, the journal may have ranked at the 70th percentile in Linguistics journals in inCites (equal to those of *Anaphors in Text*,

[5] In Web of Science, *Journal Impact Factor* is defined as "all citations to the journal in the current JCR year to items published in the previous two years, divided by the total number of scholarly items (these comprise articles, reviews, and proceedings papers) published in the journal in the previous two years." (Thomson Reuters, 2017)

[6] From: https://incites.thomsonreuters.com/#/explore/0/funder//. InCites dataset used here was updated on 2017-07-01, which includes Web of Science content indexed through 2017-03-31.

[7] In bibliometrics, *h*-index is an author-level metric that quantifies both the productivity and the citation impact of a scientist or scholar (from: http://www.pnas.org/content/102/46/16569). Journal *h*-index refers to journal's number of articles (*h*) that have received at least *h* citations over the whole period.

*Language-Meaning-Social Construction Interdisciplinary Studies*, *Primate Communication and Human Language: Vocalisation, Gestures, Imitation,* and *Determiners: Universals and Variation*).

A list of most cited source articles in the journal (freq.>=5) is shown in Table 8:

Table 8 The most cited source articles in *Glottometrics* (according to Web of Science)

| Rank | Author | Title | Year | Vol. | Times Cited |
|---|---|---|---|---|---|
| 1 | Adamic, L. A.; Huberman, B. A. | Zipf's law and the internet | 2002 | 3 | 255 |
| 2 | Li, W | Zipf's law everywhere | 2002 | 5 | 46 |
| 3 | Popescu, I. I. | On a Zipf's Law extension to impact factors | 2003 | 6 | 26 |
| 4 | Kornai, A. | How many words are there? | 2002 | 4 | 21 |
| 5 | Liu, H. | Probability distribution of dependency distance | 2007 | 15 | 19 |
| 6 | Rousseau, R. | George Kingsley Zipf. Life, Ideas, his Law and Informetrics | 2002 | 3 | 13 |
| 7 | Popescu, I. - I.; Altmann, G. | Some aspects of word frequencies | 2006 | 13 | 12 |
| 8 | Balasubrahmanyan, Viddhachalam; Naranan, Sundaresan | Algorithmic Information, Complexity and Zipf's Law | 2002 | 4 | 11 |
| 8 | Montemurro, M. A.; Zanette, D. H. | New perspectives on Zipfs law in linguistics: from single texts to large corpora | 2002 | 4 | 11 |
| 10 | Pauli, F.; Tuzzi, A. | The end of year addresses of the presidents of the Italian republic (1948-2006): Discourse similarities and differences | 2009 | 18 | 10 |
| 11 | Ferrer-i-Cancho, R. | Hubiness, length and crossings and their relationships in dependency trees | 2013 | 25 | 9 |
| 12 | Ferrer i Cancho, R.; Servedio, V. D. | Can simple models explain Zipf's law in all cases? | 2005 | 11 | 8 |
| 12 | Rochester, NY; Smith, R | Distinct word length frequencies: distributions and symbol entropies | 2012 | 23 | 8 |
| 14 | Best, K.-H. | Zur Haufigkeit von Buchstaben, Leerzeichen und anderen Schriftzeichen in deutschen Texten (On the frequency of letters, spaces and other characters in German texts) | 2005 | 11 | 7 |
| 14 | Grzybek, P. | On the systematic and system-based study of grapheme frequencies: A re-analysis of German letter frequencies | 2007 | 15 | 7 |
| 14 | Popescu, I.-I.; Best, K.-H.; Altmann, G. | On the dynamics of word classes in text | 2007 | 14 | 7 |
| 17 | Altmann, G. | Towards a theory of language | 1978 | 1 | 6 |
| 17 | Best, K.-H.; Altmann, G. | Some properties of graphemic systems | 2005 | 9 | 6 |
| 19 | Altmann, G. | Script complexity | 2004 | 8 | 5 |
| 19 | Best, Karl-Heinz | Spracherwerb, Sprachwandel und Wortschatzwachstum in Texten. Zur Reichweite des Piotrowski-Gesetzes | 2003 | 6 | 5 |
| 19 | Grzybek, P.; Kelih, | The relation between word length and | 2008 | 16 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | E.; Stadlober, E. | sentence length. An intra-systemic perspective in the core data structure | | | |
| 19 | Kelih, E. | The type-token relationship in Slavic parallel texts | 2010 | 20 | 5 |
| 19 | Köhler, R. | Quantitative Untersuchungen zur Valenz deutscher verbena | 2005 | 9 | 5 |

According to Google Scholar (up to July 8th, 2017), the *h*-index of *Glottometrics* is 14. A list of top 15 most cited references is shown in Table 9 (freq.>=5):

Table 9 The most cited source references in *Glottometrics* (according to Google Scholar)

| Rank | Times Cited | Article |
|---|---|---|
| 1 | 715 | Adamic, L. A., & Huberman, B. A. (2002). Zipf's law and the Internet. *Glottometrics*, *3*, 143-150. |
| 2 | 94 | Li, W. (2002). Zipf's Law Everywhere. *Glottometrics*, *5*, 14-21. |
| 3 | 61 | Kornai, A. (2002). How many words are there? *Glottometrics*, *4*, 61-86. |
| 4 | 50 | Popescu, I.-I. (2003). On a Zipf's Law Extension to Impact Factors. *Glottometrics*, *6*, 61-64. |
| 5 | 39 | Popescu, I.-I., & Altmann, G. (2006). Some aspects of word frequencies. *Glottometrics*, *13*, 23-46. |
| 6 | 34 | Liu, H. (2007). Probability distribution of dependency distance. *Glottometrics*, *15*, 13-23. |
| 7 | 27 | Joyce, T. (2005). Constructing a Large-Scale Database of Japanese Word Associations. *Glottometrics*, *10*, 82-98. |
| 8 | 23 | Montemurro, M. A., & Zanette, D. H. (2002). New perspectives on Zipf's law in linguistics: from single texts to large corpora. *Glottometrics*, *4*, 87-99. |
| 9 | 22 | Pauli, F., & Tuzzi, A. (2009). The End of Year Addresses of the Presidents of the Italian Republic (1948-2006): discoursal similarities and differences. *Glottometrics*, *18*, 40-51. |
| 10 | 21 | Rousseau, R. (2002). George Kingsley Zipf: life, ideas, his law and informetrics. *Glottometrics*, *3*, 11-18. |
| 11 | 16 | Wheeler, E. S. (2002). Zipf's Law and why it works everywhere. *Glottometrics*, *4*, 45-48. |
| 11 | 16 | Čech, R., & Mačutek, J. (2011). Word form and lemma syntactic dependency networks in Czech: a comparative study. *Glottometrics*, *19*, 85-98. |
| 13 | 15 | Altmann, G. (2004). Script complexity. *Glottometrics*, *8*, 68-74. |
| 13 | 15 | Best, K. H. (2003). Spracherwerb, Sprachwandel und Wortschatzwachstum in Texten. Zur Reichweite des Piotrowski-Gesetzes. *Glottometrics*, *6*, 9-34. |
| 14 | 14 | Grzybek, P., Kelih, E., & Stadlober, E. (2008). The relation between word length and sentence length: an intra-systemic perspective in the core data structure. *Glottometrics*, *16*, 111-121. |
| 15 | 13 | Körner, H. (2004). Zur Entwicklung des deutschen (Lehn-) Wortschatzes. *Glottometrics*, *7*, 25-49. |
| 15 | 13 | Altmann, G. (2002). Zipfian linguistics. *Glottometrics*, *3*, 19-26. |
| 15 | 13 | Grzybek, P. (2007). On the systematic and system-based study of grapheme frequencies: a re-analysis of German letter frequencies. *Glottometrics*, *15*, 82-91. |
| 15 | 13 | Körner, H. (2004). Zur Entwicklung des deutschen (Lehn-) Wortschatzes. *Glottometrics*, *7*, 25-49. |
| 19 | 12 | Balasubrahmanyan, V. K., & Naranan, S. (2002). Algorithmic information, complexity and Zipf´s law. *Glottometrics*, *4*, 1-26. |
| 19 | 12 | Martináková, Z., Popescu, I.-I., Mačutek, J., & Altmann, G. (2008). |

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|---|---|---|
| | | Some problems of musical texts. *Glottometrics*, *16*, 63-79. |
| 19 | 12 | Liu, H., Zhao, Y., & Huang, W. (2010). How do Local Syntactic Structures Influence Global Properties in Language Networks? *Glottometrics*, *20*, 38-58. |
| 22 | 11 | Gumenyuk, A., Kostyshin, A., & Simonova, S. (2002). An approach to the research of the structure of linguistic and musical texts. *Glottometrics*, *3*, 61-89. |
| 22 | 11 | Hřebíček, L. (2002). Zipf's Law and Text. *Glottometrics*, *3*, 27-38. |
| 22 | 11 | Kelih, E. (2009). Graphemhäufigkeiten in slawischen Sprachen: stetige Modelle. *Glottometrics*, *18*, 52-68. |
| 22 | 11 | Popescu, I.-I., & Altmann, G. (2007). Writer´s view of text generation. *Glottometrics*, *15*, 71-81. |
| 22 | 11 | Köhler, R. (2005). Quantitative Untersuchungen zur Valenz deutscher Verben. *Glottometrics*, *9*, 13-20. |
| 27 | 10 | Mačutek, J., Popescu, I.-I., & Altmann, G. (2007). Confidence intervals and tests for the h-point and related text characteristics. *Glottometrics*, *15*, 45-52. |
| 27 | 10 | Ferrer i Cancho, R., & Servedio, V. (2005). Can simple models explain Zipf's law for all exponents? *Glottometrics*, *11*, 1-8. |
| 27 | 10 | Popescu, I.-I., Best, K.-H., & Altmann, G. (2007). On the dynamics of word classes in text. *Glottometrics*, *14*, 58-71. |
| 27 | 10 | Pawlowski, A. (2005). VI. Wincenty Lutoslawski-a forgotten father of stylometry. *Glottometrics*, *8*, 83-89. |
| 27 | 10 | Best, K. H. (2005). Zur Häufigkeit von Buchstaben, Leerzeichen und anderen Schriftzeichen in deutschen Texten. *Glottometrics*, *11*, 9-31. |
| 32 | 9 | Grzybek, P., & Altmann, G. (2002). Oscillation in the frequency-length relationship. *Glottometrics*, *5*, 97-107. |
| 32 | 9 | Vulanović, R. (2008). A mathematical analysis of parts-of-speech systems. *Glottometrics 17*, 51, 65. |
| 34 | 8 | Best, K.-H. (2002). The distribution of rhythmic units in German short prose. *Glottometrics*, *3*, 136-142. |
| 34 | 8 | Fan, F. (2006). Models for dynamic inter-textual type-token relationship. *Glottometrics*, *12*, 1-10. |
| 34 | 8 | Popescu, I.-I., & Altmann, G. (2008). Zipf´s mean and language typology. *Glottometrics*, *16*, 31-37. |
| 34 | 8 | Roelcke, T. (2002). Efficiency of communication: A new concept of language economy. *Glottometrics*, *4*, 27-38. |
| 34 | 8 | Kazartsev, E. (2006). Zum Problem der Entstehung des syllabotonischen Versmaßsystems im europäischen Vers. *Glottometrics*, *13*, 1-22. |
| 34 | 8 | Best, K. H. (2001). Zur Gesetzmäßigkeit der Wortverteilung in deutschen Texten. *Glottometrics*, *1*, 1-26. |
| 40 | 7 | Ishida, M., & Ishida, K. (2007). On distributions of sentence lengths in Japanese writing. *Glottometrics*, *15*, 28-44. |
| 40 | 7 | Novosibirsk, V. K. (2001). Word length model based on the one-displaced Poisson-uniform distribution. *Glottometrics*, *1*, 87-96. |
| 40 | 7 | Grzybek, P., & Kelih, E. (2004). Anton Semënovič Budilovič. *Glottometrics*, *7*, 94-96. |
| 40 | 7 | Naumann, S., Popescu, I.-I., & Altmann, G. (2012). Aspects of nominal style. *Glottometrics*, *23*, 23-55. |
| 40 | 7 | Fenk-Oczlon, G., & Fenk, A. (2002). Zipf's tool analogy and word order. *Glottometrics*, *5*, 22-28. |
| 40 | 7 | Kelih, E. (2010). The type-token relationship in Slavic parallel texts. *Glottometrics*, *20*, 1-11. |
| 40 | 7 | Köhler, R. (2002). Power law models in linguistics: Hungarian. *Glottometrics*, *5*, 51-61. |
| 40 | 7 | Lehfeldt, W., & Altmann, G. (2002). Der altrussische Jerwandel. *Glottometrics*, *2*, 34-44. |

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|---|---|---|
| 48 | 6 | Hřebíček, L. (2002). Zipf's Law and Text. *Glottometrics*, *3*, 27-38. |
| 48 | 6 | Jayaram, B. D., & Vidya, M. N. (2006). Word length distribution in Indian languages. *Glottometrics*, *12*, 16-38. |
| 48 | 6 | Meyer, P. (2002). Laws and theories in quantitative linguistics. *Glottometrics*, *5*, 62-80. |
| 48 | 6 | Antic, G., & Altmann, G. (2005). On letter distinctivity. *Glottometrics*, *9*, 46-53. |
| 48 | 6 | Macutek, J. (2008). Runes: complexity and distinctivity. *Glottometrics*, *16*, 1-16. |
| 48 | 6 | Best, K. H. (2005). Turzismen im Deutschen. *Glottometrics*, *11*, 56-63. |
| 54 | 5 | Best, K. H., & Altmann, G. (2005). Some properties of graphemic systems. *Glottometrics*, *9*, 29-39. |
| 54 | 5 | Tuzzi, A., Popescu, I.-I., & Altmann, G. (2011). Parts-of-speech diversification in Italian texts. *Glottometrics*, *19*, 42-48. |
| 54 | 5 | Hisashi, M., & Joyce, T. (2005). Database of Two-Kanji Compound Words Featuring Morphological Family, Morphological Structure, and Semantic Category Data. *Glottometrics*, *10*, 30-44. |
| 54 | 5 | Hilberg, W. (2002). The Unexpected Fundamental Influence of Mathematics upon Language. *Glottometrics*, *5*, 29-50. |
| 54 | 5 | Peust, C. (2006). Script complexity revisited. *Glottometrics*, *12*, 11-15. |
| 54 | 5 | Prün, C. (2002). Biographical notes on GK Zipf. *Glottometrics*, *3*, 1-10. |
| 54 | 5 | Popescu, I. I., Cech, R., & Altmann, G. (2011). On stratification in poetry. *Glottometrics*, *21*, 54-59. |
| 54 | 5 | Tamaoka, K., & Altmann, G. (2004). Symmetry of Japanese Kanji lexical productivity on the left-and right-hand side. *Glottometrics*, *7*, 65-84. |
| 54 | 5 | Popescu, I. I., & Altmann, G. (2008). On the regularity of diversification in language. *Glottometrics*, *17*, 94-108. |
| 54 | 5 | Best, K. H. (2002). Der Zuwachs der Wörter auf-ical im Deutschen. *Glottometrics*, *2*, 11-16. |

Table 8 and Table 9 both show that about half of the top 15 most cited articles are from a collection on the theme "Zipf's law" published in the earlier years. Top 1 on the lists is *Zipf's law and the Internet* (Adamic & Huberman, 2002). So far it is cited as high as 255 times by Web of Science and 715 times by Google Scholar. Other source articles have much fewer times cited, covering the canonical topics in QL including word frequency, word and sentence length, probability distribution, dependency syntax, syntactic network, script complexity and text characteristics.

Despite of the high times cited of a few studies, the majority of the source articles have little contribution to the impact, especially in the recent decade. Whether the academic impact of QL research only displays after a longer period needs further exploration.

### 3.4.2 Citing Articles

*Glottometrics* is cited by a variety of references or citing articles, whose total number increases by year (data in 2017 not complete yet), as Figure 19 shows:

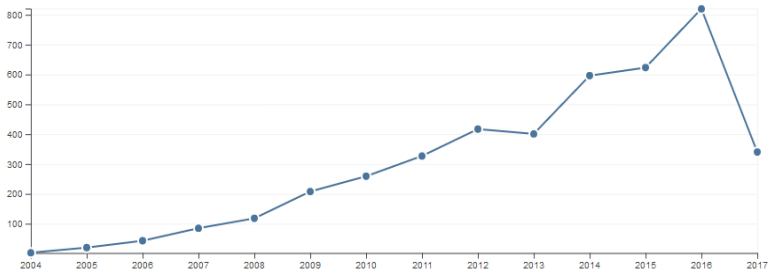


Figure 19 Citing frequencies by year

There is 1 among the citing articles marked as "highly cited article" in Web of Science (It is also one of the source articles in the journal):

Ferrer-i-Cancho, R. Hubiness. (2013). Length and crossings and their relationships in dependency trees. *Glottometrics*. *25*: 1-21.

A similar bibliometric analysis of these citing articles is conducted in Web of Science. Results are as given in Table 10~Table 17:

Table 10 References citing *Glottometrics*: type of article

| Type of Article | Records | % of 638 |
|---|---|---|
| Article | 479 | 75.08% |
| Meeting | 156 | 24.45% |
| Book | 55 | 8.62% |
| Other | 44 | 6.90% |
| Review | 21 | 3.29% |
| Editorial | 5 | 0.78% |
| Letter | 2 | 0.31% |

Table 11 References citing *Glottometrics*: categories

| Category | Records | % of 638 |
|---|---|---|
| Science Technology | 477 | 74.77% |
| Technology | 369 | 57.84% |
| Social Sciences | 309 | 48.43% |
| Physical Sciences | 201 | 31.51% |
| Life Sciences Biomedicine | 103 | 16.14% |
| Arts Humanities | 37 | 5.80% |

Table 12 References citing *Glottometrics*: research areas

| Research Area | Records | % of 638 |
|---|---|---|
| Computer science | 287 | 44.98% |
| Linguistics | 172 | 26.96% |
| Mathematics | 153 | 23.98% |
| Telecommunications | 101 | 15.83% |
| Engineering | 95 | 14.89% |
| Physics | 77 | 12.07% |
| Information science library science | 65 | 10.19% |
| Communication | 59 | 9.25% |
| Science technology other topics | 54 | 8.46% |
| Mathematical computational biology | 48 | 7.52% |

Table 13 References citing *Glottometrics*: journals

| Journal | Records | % of 638 |
|---|---|---|
| *Journal of Quantitative Linguistics* | 44 | 6.90% |
| *Glottometrics* | 27 | 4.23% |
| *Lecture Notes in Computer Science* | 18 | 2.82% |

| | | |
|---|---|---|
| *Physica A Statistical Mechanics and Its Applications* | 17 | 2.67% |
| *Handbucher zur sprach und kommunikationswissenschaft* | 16 | 2.51% |
| *Plos ONE* | 16 | 2.51% |
| *Quantitative Linguistics Quantitative Linguistik* | 13 | 2.04% |
| *Quantitative Linguistics* | 11 | 1.72% |
| *Analyses of Script Properties of Characters and Writing Systems* | 9 | 1.41% |
| *Scientometrics* | 9 | 1.41% |
| *Physica A* | 8 | 1.25% |
| *Physical Review E* | 8 | 1.25% |
| *Physical Review E Statistical Nonlinear and Soft Matter Physics* | 7 | 1.10% |
| *Journal of Informetrics* | 6 | 0.94% |
| *Complexity* | 5 | 0.78% |
| *European Physical Journal B* | 5 | 0.78% |
| *IEEE Transactions on Parallel and Distributed Systems* | 5 | 0.78% |

Table 14 References citing *Glottometrics*: conferences

| No. | Conference | Records | % of 638 |
|---|---|---|---|
| 1 | IEEE International Conference on Communications (ICC) | 3 | 0.47% |
| 2 | 15th IEEE int conf on trust security and privacy in comp and commun 10th IEEE int conf on big data science and engineering 14th IEEE int symposium on parallel and distributed proc with applicat IEEE trustcom bigdatase ispa | 2 | 0.31% |
| 3 | 15th IEEE international symposium on a world of wireless mobile and multimedia networks wowmom | 2 | 0.31% |
| 4 | 2016 IEEE trustcom bigdatase ispa | 2 | 0.31% |
| 5 | 2nd international conference on web information systems and technologies | 2 | 0.31% |
| 6 | 34th IEEE conference on computer communications infocom | 2 | 0.31% |
| 7 | 8th international conference on hybrid artificial intelligent systems hais | 2 | 0.31% |
| 8 | 8th polish symposium of physics in economy and social sciences fens | 2 | 0.31% |
| 9 | IEEE global communications conference globecom | 2 | 0.31% |
| 10 | IEEE global telecommunications conference globecom 05 | 2 | 0.31% |
| 11 | IEEE globecom workshops gc wkshps | 2 | 0.31% |

Table 15 References citing *Glottometrics*: authors (top 10)

| Author | Records | % |
|---|---|---|
| Altmann G. | 35 | 5.486 |
| Liu H. | 30 | 4.702 |
| Kohler R. | 20 | 3.135 |
| Piotrowski R. | 13 | 2.038 |
| Ferrer-i-cancho R. | 12 | 1.881 |
| Tassiulas L. | 11 | 1.724 |
| Popescu II. | 9 | 1.411 |
| Sourlas V. | 8 | 1.254 |
| Macutek J. | 8 | 1.254 |
| Ausloos M. | 8 | 1.254 |

Table 16 References citing *Glottometrics*: countries

| Country | Records | % |
|---|---|---|
| China | 169 | 26.49% |
| USA | 96 | 18.81% |
| Germany | 50 | 7.84% |
| Spain | 39 | 6.11% |
| England | 33 | 5.17% |
| Italy | 32 | 5.02% |
| Belgium | 26 | 4.08% |
| Japan | 24 | 3.76% |
| Greece | 20 | 3.14% |
| Canada | 17 | 2.67% |
| Israel | 16 | 2.51% |

| | | |
|---|---|---|
| UK | 16 | 2.51% |

Table 17 References citing *Glottometrics*: affiliations

| Affiliation | Records | % of 638 |
|---|---|---|
| Zhejiang University | 37 | 5.80% |
| Rutgers State University | 13 | 2.04% |
| Polytechnic University of Catalonia | 11 | 1.72% |
| Universidad Nacional Autonoma de Mexico | 9 | 1.41% |
| University of Thessaly | 9 | 1.41% |
| University System of Georgia | 9 | 1.41% |
| Princeton University | 8 | 1.25% |
| Sapienza University Rome | 8 | 1.25% |
| University of London | 8 | 1.25% |
| Beijing University of Posts Telecommunications | 7 | 1.10% |
| Northwell Health | 7 | 1.10% |
| Princeton University | 7 | 1.10% |

To our surprise, results in Table 11 and Table 13 clearly display that *Glottometrics* is more cited by references in "Science and Technology" than in "Social Science" (the categories in which it falls). In other words, its academic influence goes far beyond linguistics itself, more in natural sciences than social science and art and humanities. As Table 12 shows, the achievements and methods are often referred and applied in a wide ranges of research areas: Computer science, Linguistics, Mathematics, Telecommunications, Engineering, Physics, Information science library science, Communication, etc. Interdisciplinary studies attract much attention in the scientific community. As is mentioned in 3.4.1, for example, Zipf's law, a discovery originated in linguistics, has wide application "everywhere" in disciplines ranging from bibliometrics to physics (Li, 2002; Popescu, 2003); Syntactic network also provides another instance of complex network in statistical physics; achievements in text generation, analysis and classification are employing in natural language processing. In addition, the vitality of QL research is also facilitated by the research paradigm of QL, i.e., hypothesizing, data collection, statistical diagnostics, accepting or rejecting the hypothesis, and explanation (Köhler, Altmann, & Piotrowski, 2005). It is a well-established and widely accepted paradigm from the perspective of philosophy of science. As for the geographical distribution, the countries with the most citing articles are from Europe and Asia, none from Australian or African countries. The top 3 are China, US and Germany. And the top 3 institutions with most citing articles are Zhejiang University, Rutgers State University and Polytechnic University of Catalonia.

### 3.4.3 Cited References

Co-cited references form the research basis of studies. Given below is the top 30 cited references which frequently appear in the bibliographies of *Glottometrics*:

Table 18 Top 30 cited references in *Glottometrics*

| Rank | Freq. | Cited Reference |
|---|---|---|
| 1 | 32 | Zipf G. K. (1949). *Human Behavior and the Principle of Least Effort*. Cambridge, Mass.: Addison-Wesley. |
| 2 | 29 | Wimmer, G. & Altmann, G. (1999). *Thesaurus of Univariate Discrete Probability Distributions*. Essen: Stamm. |
| 3 | 23 | Altmann, G. (1988). *Wiederholungen in Texten*. (*Quantitative Linguistics 36*). Bochum: Studienverlag Brockmeyer. |
| 4 | 22 | Zipf, G.K. (1935) *The Psycho-Biology of Language. An Introduction to Dynamic Philology*. Boston: Houghton-Mifflin. |
| 5 | 20 | Köhler, R. (1986) . *Zur Linguistischen Synergetik: Struktur und Dynamik der Lexik*. Bochum: Brockmeyer. |
| 6 | 19 | Altmann, G. (1983). Das Piotrowski-Gesetz und seine Verallgemeinerung. In: Best, K.-H., Kohlhase, Jörg (Hrsg.): *Exakte Sprachwandelforschung. Theoretische Beiträge, Statistische Analysen und Arbeitsberichte* (S. 59-90). Göttingen: edition herodot. |
| 6 | 19 | Wimmer, G., Altmann, G. (2002). *Unified derivation of some linguistic laws*. Paper at the Graz Conference on Word Length, August 2002. |
| 8 | 18 | Popescu, I.-I., Grzybek, P., Jayaram, B.D., Köhler, R., Krupa, V., Mačutek, J., Pustet, R.,Uhlířová, L., & Vidya, M.N. (2009). *Word Frequency Studies*. Berlin, New York: de Gruyter. |
| 9 | 16 | Best, K.-H. (2001). *Wo kommen die deutschen Fremdwörter her?* Göttinger Beiträge zur Sprachwissenschaft 5, 7-20. |
| 9 | 16 | Popescu, I.-I., Mačutek, Altmann, G. (2008a). *Aspects of word frequencies*. Lüdenscheid: RAM. |
| 11 | 15 | Altmann, G. (2005). Der Diversifikationsprozess. In: Altmann, G., Köhler, R., Piotrowski, R.G. (eds.), *Handbook of Quantitative Linguistics*, Art. 65. Berlin: de Gruyter (in print). |
| 12 | 14 | Hřebíček, L. (1997). *Lectures on text theory*. Prague, Oriental Institute. |
| 13 | 13 | Altmann, G. (1980). Prolegomena to Menzerath.s law. *Glottometrika 2*, 1-10. |
| 13 | 13 | Körner, Helle (2004). Zur Entwicklung des deutschen (Lehn-)Wortschatzes. *Glottometrics 7*, 25-49. |
| 13 | 13 | Rothe, Ursula (1991). Diversification Processes in Grammar. An Introduction. In: Rothe, Ursula (Hrsg.), *Diversification Processes in Language: Grammar*: 3-32. Hagen: Margit Rottmann Medienverlag. |
| 16 | 12 | Altmann, G. (1991). Modeling diversification phenomena in language. In: Rothe, U. (Ed.), *Diversification Processes in Language: Grammar*: 33-46. Hagen: Rottmann. |
| 17 | 11 | Amano, N. & Kondo, K. (2000). *Nihongo-no goi tokusei [Lexical properties of Japanese]*. Tokyo: Sanseido. |
| 17 | 11 | Best, K.-H. (ed.) (2001). *Häufigkeitsverteilungen in Texten*. Göttingen: Peust & Gutschmidt |
| 17 | 11 | Popescu, I.-I., Altmann, G., Köhler, R. (2008). *Zipf´s law – a new view. Quality and Quantity* (submitted). |
| 20 | 10 | Altmann, G. (1993). Phoneme counts. *Glottometrika 14*, 54-58. |
| 20 | 10 | Baayen, H. (2001). *Word Frequency Distributions*. Dordrecht: |

| | | |
|---|---|---|
| | | Kluwer Academic Publishers. |
| 20 | 10 | Hřebíček, L. (2000). *Variation in sequences*. (Contributions to general text theory). Prague: Oriental Institute. |
| 20 | 10 | Popescu, I.-I., Čech, R. & Altmann, G. (2011). *The Lambda-structure of Texts*. RAM-Verlag. |
| 21 | 10 | Baayen, H. (2001). *Word Frequency Distributions*. Dordrecht: Kluwer Academic Publishers. |
| 22 | 10 | Hřebíček, L. (2000). *Variation in sequences*. (Contributions to general text theory). Prague: Oriental Institute. |
| 23 | 10 | Popescu, I.-I., Čech, R. & Altmann, G. (2011). *The Lambda-structure of Texts*. RAM-Verlag. |
| 24 | 9 | Altmann, G. (1992). Das Problem der Datenhomogenität. *Glottometrika 13*, 105- 120. |
| 25 | 9 | Köhler, Reinhard (2005), Synergetic Linguistics. In: Köhler, Reinhard, Altmann, G., Piotrowski, Rajmund G. [ed.]: *Quantitative Linguistik*. Ein internationales Handbuch. Quantitative Linguistics. An International Handbook: 760-775. (= HSK27) Berlin, New York: de Gruyter.. |
| 26 | 9 | Ord, J. K. (1972). *Families of frequency distributions*. London: Griffin. |
| 27 | 9 | Pfeifer, Wolfgang (2000). *Etymologisches Wörterbuch des Deutschen*. 5. Auflage. München: Deutscher Taschenbuchverlag. |
| 28 | 9 | Popescu, I.-I. (2006). *Text ranking by the weight of highly frequent words. Exact methods in the study of language and text*, edited by Peter Grzybek and Reinhard Köhler: 557-567. Berlin/New York: Mouton de Gruyter. |
| 29 | 9 | Wimmer, Gejza, & Altmann, G. (1996). The Theory of Word Length Distribution: Some Results and Generalizations. In: Schmidt, Peter (ed..), *Glottometrika 15*, 112-133. Trier: Wissenschaftlicher Verlag Trier. |
| 30 | 9 | Wimmer, Gejza, Köhler, Reinhard, Grotjahn, Rüdiger, & Altmann, G. (1994). Towards a Theory of Word Length Distribution. *Journal of Quantitative Linguistics 1*, 98-106. |

Among the listed items, *The Psycho-Biology of Language: An Introduction to Dynamic Philology* (Zipf, 1935), *Human Behavior and the Principle of Least Effort* (Zipf, 1949) and *Zur Linguistischen Synergetik: Struktur und Dynamik der Lexik* (Köhler, 1986) are the classic references in which the basic conceptions, principles and theories of QL are proposed. Others focus on laws, word frequencies and length and probability distribution and so on. Several literatures are written in German, manifesting again the tradition of QL research in Germany.

We also calculate the proportions of the journals cited in the bibliographies of *Glottometrics*. Among the 1234 journals cited by *Glottometrics*, those cited more than 5 times are shown in Table 19:

Table 19 Journals cited by *Glottometrics* (freq.>=5)

| No. | Journal Title | Freq. | Proportion |
|---|---|---|---|
| 1 | *Glottometrics* | 225 | 18.23% |
| 2 | *Journal of Quantitative Linguistics* | 185 | 14.99% |

| | | | |
|---|---|---|---|
| 3 | *Göttinger Beiträge zur Sprachwissenschaft* | 37 | 3.00% |
| 4 | *Glottotheory* | 21 | 1.70% |
| 5 | *Biometrika* | 16 | 1.30% |
| 6 | *Physica A* | 15 | 1.22% |
| 6 | *Quality and Quantity* | 15 | 1.22% |
| 6 | *Science* | 15 | 1.22% |
| 9 | *Information and Control* | 14 | 1.13% |
| 10 | *Language* | 13 | 1.05% |
| 11 | *Physical Review Letters* | 12 | 0.97% |
| 12 | *Computers and the Humanities* | 10 | 0.81% |
| 12 | *American Journal of Psychology* | 10 | 0.81% |
| 14 | *Bell System Technical Journal* | 9 | 0.73% |
| 15 | *Nature* | 8 | 0.65% |
| 15 | *Linguistic Inquiry* | 8 | 0.65% |
| 15 | *Folia Linguistica Historica* | 8 | 0.65% |
| 15 | *Physical Review E* | 8 | 0.65% |
| 15 | *Journal of Experimental Psychology* | 8 | 0.65% |
| 20 | *Computational Linguistics* | 7 | 0.57% |
| 20 | *Linguistics* | 7 | 0.57% |
| 20 | *Behavior Research Methods, Instruments & Computers* | 7 | 0.57% |
| 23 | *Literary and Linguistic Computing* | 6 | 0.49% |
| 23 | *Information and Control* | 6 | 0.49% |
| 25 | *Lingua* | 5 | 0.41% |
| 25 | *Cognition* | 5 | 0.41% |
| 25 | *Anzeiger für Slavische Philologie* | 5 | 0.41% |
| 25 | *Europhysics Letters* | 5 | 0.41% |
| 25 | *Theoretical linguistics* | 5 | 0.41% |
| 25 | *Animal Behavior* | 5 | 0.41% |
| 25 | *Cognitive Science* | 5 | 0.41% |
| 25 | *Language and Cognitive Processes* | 5 | 0.41% |
| 25 | *Scientometrics* | 5 | 0.41% |

As Table 19 shows, bibliographies in *Glottometrics* cover various disciplines from natural to social sciences as a result of the broad spectrum of QL investigation. References from systems science, statistics and computation sciences are often quoted, which differs QL from other branches of linguistics in methodology. Table 19 also shows that the proportions of linguistics journals are comparatively lower in the bibliographies.

It is noticed that *Glottometrics* and *Journal of Quantitative Linguistics* take up about 30% of the journals cited. According to 2014 JCR Science Edition, 85% of the ESCI journals have self-citation rates of 15% or less[8]. The self-cited rate of 18.23% is slightly higher, thus may reduce the diversity of source publications.

As is shown in Table 19, top linguistics journals in Table 20 and Table 22 (see to the Appendix), especially in the "mainstream" sense, are rarely quoted in

[8] See to: http://wokinfo.com/essays/journal-selection-process/

*Glottometrics* (except for *Lingua* and *Linguistic Inquiry*).

# 4. Concluding Remarks

In this paper, we conduct a bibliometric study of *Glottometrics* by analyzing the metadata of 37 volumes during 2001~2017, based on data from the library and self-built corpora. Our analysis covers three main aspects: a. publication profile of the journal including publication frequency, type of work, length of article and language; b. authors, countries and regions, affiliations contributing to the journal as well as funding; c. research content of the articles including keywords, abstracts, objects studied; d. citation analysis.

Results suggest that QL research is characterized by addressing linguistics problems by scientific approaches. It encompasses nearly all the sub-disciplines of theoretical and applied linguistics, as a confirmation and supplementation of Chen and Liu (2014)'s findings. In this sense, "the objects and the epistemological interest of QL research do not differ principally from those of other linguistic and textological disciplines, nor is there a principal difference in epistemological interest." (Köhler, 2012)

Since its first publication, *Glottometrics* has been serving as an unparalleled platform of QL research. With its academic impact, it undergoes revolutions in alliance with another authoritative journal, *Journal of Quantitative Linguistics*. Certainly, as a comparatively "younger" publication, *Glottometrics* still has its inadequacies. Next some remarks and suggestions based on the results are presented for further improvements.

First, In terms of publication, the completeness of elements is expected to be improved. In our study, the reliability of bibliometric analysis is affected by a lack of data. Nowadays for a journal in modern sense, informative elements are required by almost all the citation databases including: journal title, year of publication, volume and/or issue number, page number, article title, abstract, keywords, author name(s), full address for every author, institution (name, city, country or region), fund or project, subject, research area, citations. To our delight, since its acceptation by Scopus in 2017, citation analysis reports will be generated after several clicks, thus making bibliometric analysis more efficient in the near future. Besides, since timeliness of publication implies ongoing viability in the research area, Glottometrics

needs to keep a regular publication and a steady flow of articles online or in print are of fundamental importance (A reference is that 53% of 2016 SSCI journals in the WOS category of Linguistics are quarterly). Also, for the sake of global academic communication, full texts in English are necessary. The recent rise of English in proportion just indicates the efforts made by the editors to be more international.

Second, *Glottometrics* is on the way to embrace a wider research community. Over the past 17 years, the majority of contributors to *Glottometrics* are from the European universities where QL tradition is deeply rooted. With high productive scholars like Best K.-H. and Altman G., the impact of Germany has long been unparalleled. This can be seen in the statistical results of language used in the manuscripts, language studied as objects of research as well as the geographic distribution of contributors. Recent years see a pleasing emergence of China and Brazil. It is also noted that the author's nationality is largely related to the language studied or as source material, *German* and *English* as good examples. In this view, cooperation from more countries and regions is welcome to enrich language data. A journal with international focus always needs a diverse group of authors, editors and editorial advisory board members, especially the highly cited editors and authors. Certainly, more funding in a variety of sources (e.g. private industry) is of fundamental importance for the development of the discipline.

Third, in QL research, a possible combination is to perform the activities mentioned on the linguistic and textual objects above. From the perspective of research content, besides the wide coverage of exploration, in recent decade, researchers turn their eyes from the canonical word studies to textual levels. Syntax and semantics need further investigation towards a higher stage of synergetic linguistics. Areas of applied linguistics in broad sense such as language acquisition and psycholinguistics almost remain untouched while may be quite promising in this century. Another perspective may be called the activities or approaches of QL research: metrification, quantitative analysis and description, numerical classification, diagnostic comparison and trend detection, modelling, theory construction, explanation, extension, methodological elaboration, practical application (R. Köhler et al., 2005). Some of them have already applied in a number of studies, some needs to form a more specific procedure, and some are rarely tried for many reasons. It is highly recommended that the research problems should be proposed in such a way that they can arouse the interest of the "mainstream" linguists.

Finally, as for citation, an interesting phenomenon is that in contrast to a limited influence in linguistics, *Glottometrics* has its academic impact in other disciplines such as information sciences. Thanks to the endeavors made to promote interdisciplinary research, *Glottometrics* has kept its vitality by citation despite of high professionality in mathematics and statistics. Meanwhile, due to methodological consideration, the academic impact of QL remains restricted in a comparatively smaller circle. Of course a better acceptation by a wider community both within and beyond linguistics itself is expected. Therefore, it is advised that the top journals in the linguistics community be cited more, and the journal's self-cited rate be controlled below 15%. After all, the essence of QL should be overshadowed by any theoretical gap or methodological divide.

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# Appendix: Citations of Linguistic Journals

In reference to in Journal Citation Report, the top linguistics journals in 2016 are as follows in Table 20:

Table 20 2016 top linguistics journals in JCR ranked by Journal Impact Factor

| No. | Journal Title | *Total Cites*[9] | *Journal Impact Factor* | *Eigenfactor Score*[10] |
|---|---|---|---|---|
| 1 | *Applied Linguistics* | 2797 | 3.593 | 0.00251 |
| 2 | *Journal of Memory and Language* | 8541 | 3.065 | 0.00923 |
| 3 | *Bilingualism-Language and Cognition* | 2210 | 3.010 | 0.00437 |
| 4 | *Journal of Fluency Disorders* | 968 | 2.714 | 0.00101 |
| 5 | *Computational Linguistics* | 2235 | 2.528 | 0.00101 |
| 6 | *Brain and Language* | 6186 | 2.439 | 0.00971 |
| 7 | *ReCALL* | 595 | 2.333 | 0.00081 |
| 8 | *Language Learning & Technology* | 1189 | 2.293 | 0.00115 |
| 9 | *International Journal of Language & Communication Disorders* | 1745 | 2.195 | 0.00321 |
| 10 | *Cognitive Linguistics* | 1010 | 2.135 | 0.00141 |
| 11 | *Computer Assisted Language Learning* | 976 | 2.121 | 0.00115 |
| 12 | *Annual Review of Applied Linguistics* | 723 | 2.083 | 0.00111 |
| 13 | *Language Learning* | 3198 | 2.079 | 0.00415 |
| 14 | *TESOL Quarterly* | 3174 | 2.056 | 0.00219 |
| 15 | *Studies in Second Language Acquisition* | 2274 | 2.044 | 0.00198 |
| 16 | *Applied Psycholinguistics* | 2095 | 1.970 | 0.00267 |
| 17 | *Language Teaching* | 849 | 1.913 | 0.00166 |
| 18 | *Research on Language and Social Interaction* | 1016 | 1.896 | 0.00301 |
| 19 | *Language Cognition and Neuroscience* | 413 | 1.852 | 0.00194 |
| 20 | *Journal of Speech Language and Hearing Research* | 6675 | 1.771 | 0.00125 |

Results of citation analysis of the top journals in Table 20 are provided below:

Table 21 Results of citation analysis of the journals in Table 20

[9] In Web of Science, *Total Cites* or the total number of times that a journal has been cited by all journals included in the database in the JCR year (Thomson Reuters, 2017).

[10] In Web of Science, *Eigenfactor Score* is "based on the number of times articles from the journal published in the past five years have been cited in the JCR year, but it also considers which journals have contributed these citations so that highly cited journals will influence the network more than lesser cited journals." (Thomson Reuters, 2017)

| No. | Journal | Results found | *h*-index | Average citations per item |
|---|---|---|---|---|
| 1 | *Applied Linguistics* | 849 | 61 | 15.73 |
| 2 | *Journal of Memory and Language* | 1452 | 119 | 48.02 |
| 3 | *Bilingualism-Language and Cognition* | 642 | 39 | 11.63 |
| 4 | *Journal of Fluency Disorders* | 797 | 40 | 9.26 |
| 5 | *Computational Linguistics* | 814 | 59 | 19.62 |
| 6 | *Brain and Language* | 5097 | 130 | 23.63 |
| 7 | *ReCALL* | 201 | 20 | 6.55 |
| 8 | *Language Learning & Technology* | 475 | 39 | 11.27 |
| 9 | *International Journal of Language & Communication Disorders* | 1357 | 47 | 9.86 |
| 10 | *Cognitive Linguistics* | 503 | 35 | 9.12 |
| 11 | *Computer Assisted Language Learning* | 306 | 23 | 6.84 |
| 12 | *Annual Review of Applied Linguistics* | 118 | 18 | 9.35 |
| 13 | *Language Learning* | 698 | 60 | 20.73 |
| 14 | *TESOL Quarterly* | 1224 | 55 | 11.1 |
| 15 | *Studies in Second Language Acquisition* | 760 | 44 | 8.5 |
| 16 | *Applied Psycholinguistics* | 816 | 59 | 16.89 |
| 17 | *Language Teaching* | 276 | 21 | 6.13 |
| 18 | *Research on Language and Social Interaction* | 370 | 37 | 17.11 |
| 19 | *Language Cognition and Neuroscience* | 380 | 11 | 2.39 |
| 20 | *Journal of Speech Language and Hearing Research* | 2661 | 109 | 26.38 |

Google also releases another list of top publications in the subcategory of "Language and Linguistics" in the 2017 version of Scholar Metrics:

Table 22 top publications in Language and Linguistics[11]

| No. | Publication | *h*5-index[12] | *h*5-median |
|---|---|---|---|
| 1 | *Language Learning* | 42 | 64 |
| 2 | *Journal of Memory and Language* | 39 | 60 |
| 3 | *Applied Linguistics* | 34 | 46 |
| 4 | *Natural Language & Linguistic Theory* | 30 | 51 |
| 5 | *Language* | 28 | 48 |
| 6 | *Applied Psycholinguistics* | 28 | 41 |
| 7 | *Linguistic Inquiry* | 27 | 46 |
| 8 | *Lingua* | 27 | 39 |
| 9 | *Studies in Second Language Acquisition* | 26 | 49 |
| 10 | *Journal of Phonetics* | 26 | 36 |
| 11 | *International Journal of Bilingualism* | 24 | 32 |
| 12 | *Journal of Child Language* | 23 | 30 |
| 13 | *Language and Linguistics Compass* | 22 | 36 |
| 14 | *Journal of Neurolinguistics* | 21 | 34 |

[11] From: https://scholar.google.com/citations?view_op=top_venues&hl=en&vq=hum_languagelinguistics. This release covers articles published in 2012-2016 and includes citations from all articles that are indexes in Google Scholar as of June 2017.

[12] In Google Scholar Metrics, *h*5-index means the *h*-index in the five years, and *h*5-median means *h*-median in the five years.

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|---|---|---|---|
| 15 | *Language Learning and Development* | 20 | 32 |
| 16 | *Language Sciences* | 20 | 31 |
| 17 | *Second Language Research* | 20 | 31 |
| 18 | *Language, Cognition and Neuroscience* | 20 | 30 |
| 19 | *First Language* | 18 | 29 |
| 20 | *Language and Speech* | 18 | 27 |