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Scientometric portrait of Professor Wolfgang Glänzel, an expert in the field of scientometrics

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Professor Wolfgang Glänzel, an outstanding and leading professor at the University of Leuven (KU Leuven) in Belgium, received the international Derek John de Solla Price Award for remarkable contributions to the quantitative studies of science in 1999. During his 37yearsof scientific career, 276articles have been individually or collaboratively indexed with his name in Web of Science. Thirty five out of 276 papers were single authored by Glänzel, and the other 241 ones were collaborative works. Glänzel's highest level of scientific productivity with 122 documents was during the years 2008 to 2017, when he was 53 to 62 years old. *Scientometrics* was his preferred journal. Glänzel has mainly collaborated with researchers from Hungary and Belgium, specifically some of the KU Leuven and the Hungarian Academy of Sciences. For instance, outstanding researchers including Schubert, Thijs, Braun and Zhang are part his authorship teams. Professor Glänzel has done considerable work in areas such as hybrid clustering, text mining, citation analysis, bibliometric analysis, scientometric indicators, altmetrics, and others.

Keywords: Scientometric portrait; Bibliometrics; Bio-bibliometrics; Wolfgang Glänzel

Introduction

Scientometrics is the field of study that uses mathematical methods to measure, monitor and analyse science, technology, and innovation (STI) in terms of the quantity and quality. Hess in1997 defined scientometrics as the "quantitative study of science, communication in science, and science policy"[1]. Researchers and scientists are the most important pillars of science, technology and innovation. Evaluating the performance of individual researchers and scientists and measuring the impact of their research is the main objective of bio-bibliometric analysis. This type of study, in which a researcher or a scientist is scientifically and methodically assessed using bibliometric techniques, is called "scientometric portrait", "biographical bibliometrics" or 'bio-bibliometrics"[2]. The current study evaluates and presents the research performance of Wolfgang Joachim Emil Glänzel.

Wolfgang Joachim Emil Glänzel, more commonly known as Wolfgang Glänzel in the scientific communities, was born on April 13, 1955 in Frankfurt, Germany. He is a full professor at KU Leuven (Belgium), and serves as the director of the Centre for Research and Development Monitoring (ECOOM) at the KU Leuven Belgium. He holds a PhD in mathematics from the Eötvös Lorand University (ELTE) in Budapest obtained in 1984 as well as a PhD in the Social Sciences obtained from Leiden University (Netherlands) in 1997. Among the specialized fields thoroughly studied by this prominent researcher of the KU Leuven Belgium, 'quantitative studies of science', 'models of the information processes in scientific research', ' theories of probability distributions'[3], 'a model of scientific collaboration', 'national-specific scientific indicators', 'citation analysis', 'bibliographic couplings', 'journal classification', etc. could have been outstandingly outlined[4].

Glänzel is currently the Editor-in-Chief of *Scientometrics* and the Secretary-Treasurer of the International Society for Scientometrics and Informetrics (ISSI). He has worked as an editorial board member of the *Journal of Informetrics*, and he also served as an Academic Editor of *PLoS One*. Glänzel is also affiliated with associations including

the Hungarian Humboldt Association, the American Association for the Advancement of Science (AAAS), the Association for Information Science and Technology (ASIS&T) and the GeWiF - Gesellschaft für Wissenschafts for schung. In addition, he is a senior scientist affiliated with the Science Policy & Scientometrics section of the Library of the Hungarian Academy of Sciences in Budapest (Hungary) and was Visiting Professor at the North China University of Water Conservancy and Electric Power, Zhengzhou China, Visiting Professor at the Faculty of Social Sciences at University of Kent (UK), Guest Professor at the Zhejiang University (Hangzhou, China), Guest Professor at the Shanxi Medical University (Taiyuan, China), Guest Professor at the Chengdu University (China), Visiting Professor at Dalian University of Technology (China), Guest Professor at the Wuhan University (China)[3].

Glänzel has authored or co-authored more than 6 books and book chapters, and 276 papers published in prominent journals including *Scientometrics*, *Journal of Informetrics*, *Information Processing & Management*, *Journal of the Association for Information Science and Technology*, and *Journal of Information Science*; as well as more than 60 papers published in international conference proceedings. Moreover, he is the peer-reviewer of a number of leading international journals, and the member of international programme committee. Glänzel has made many contributions to the fields of bibliometrics, scientometrics and science policy. Moreover, as a member of the International Society for Informetrics and Scientometrics (ISSI), Glänzel has lectured and participated in conferences in the fields of scientometrics, quantitative science studies and other related areas in Hungary, Belgium, Netherlands, Austria, Germany etc.

In 1999, Professor Wolfgang Glänzel received the Derek de Solla Price Memorial Award, or Price Medal, the highest scientometrics award for his outstanding contributions to quantitative science studies[5]. He also won other honours and awards such as Junior Scientist Award of the Hungarian Academy of Sciences.

Numerous scientometric portraits eminent scientists such as *Judit Bar-Ilan*[6,7,8], *B.K. Sen*[9], *Mahalanobis*[10], *Garfield*[11,12], *Jan Hendrik Oort*[13], *Mike Thelwall*[14], *Santiago Grisolía*[15], *Nayana Nanda Borthakur*[16], *Sivaraj Ramaseshan*[17], *Tibor Braun*[18], *Khoo Kay Kim*[19], *Dorothy Crowfoot Hodgkin*[20], *Professor Mauro Guerrini*[21] and others exist. So far, there is no known portrait of Prof. Glanzel, the eminent scientometrician. This study attempts to create one.

Objectives of the study

- To evaluate the scientific research performance of Prof. Glanzel;
- To identify the research fields studied and reviewed by the researcher and to analyse the publication pattern of the researcher;
- To identify scientific collaborators and research team(s) and to find out and evaluate co-authorships based on ideational influence indicators;
- To identify the partner countries and institutions that have played a more significant role in the development of the researcher career;
- To assess the journals in which the researcher published his documents and to analyze his most cited documents, identify most used keywords, etc.

Methodology

The present research was a scientometric study in which bibliometric indicators and techniques have been used. The papers published by Professor Wolfgang Glänzel in the journals indexed by the Clarivate Analytics Web of Science, during the period from 1983 to 2020 have been considered for the present study. Professor Glänzel's first published work indexed in the database is of the year 1983.

Using Web of Science's advanced search, the term 'AI=A-6280-2008 OR AU=Glanzel Wolfgang' was explored in indexes, including '*Science Citation Index Expanded (SCI-EXPANDED)*', '*Social Sciences Citation Index (SSCI)*', '*Arts & Humanities Citation Index (A&HCI)*', '*Conference Proceedings Citation Index- Science (CPCI-S)*', '*Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH)*'.

The search strategy led to the retrieval of 276 documents as on 19 February2020. In the second step, the extracted and collected data were analysed according to the objectives of the study. Software such as HistCite, NodeXL, Publish or Perish, Microsoft Excel and WordArt (online word cloud art creator: WordArt.com) were used. To analyse the co-authorship network and scientific collaborations, to identify the influential co-authors, to find out the

related active and influential institutions, countries, authors and journals, and to determine the fields mostly studied by the researcher, NodeXL, Publish or Perish, HistCite and WordArt were respectively used.

Analysis

Figures 1 and 2 show that the number of documents written by Wolfgang Glänzel or published in his collaboration covered in journals indexed by the Web of Science. The figures indicate that the number of his scholarly documents rose from 13 documents during 1983-1987 to nearly 60 during the period 2013-2017. In other words, the highest publication rate of this researcher is limited to the years 2008-2012, and the highest number of his citations are from the years 2003-2007.

Also, the research impact-related results indicate that Glänzel was able to have the greatest impact on the scientific community between 1998 and 2012. In other words, as the citation fertility for scientific documents is estimated at least 2 years, considering the low citations of recent years compared to the middle years, it can be reasoned that the recent documents of this researcher may not have had enough time to be cited adequately, and they would not have been still being considered or cited by the scientific community to impact the field(s) or the community. Therefore, it is reasonable that the citations of the middle-year works have been more than those published in the recent years.

Figure 3 implies Professor Glänzel's37-years performance in the field of scientometrics. In general, the entire research activity could be shown in 8 age periods/divisions. As it could be observed, out of all the 276 documents published by this researcher, 40 documents (14.4%) are related to the early years of his career as aged 28-37 years old, 92 documents (33.3%) of his research outputs are related to his years of 38-52, and 144 of his documents go back to the period as aged 53-65 years old. Therefore, it can be said that more than half (52.7%) of the documents contributed by this researcher are approximately related to the same age of 53-65.

During the years 1983-2020, Glänzel has individually contributed 35 documents (12.6%) as a single author and has collaboratively published 241 documents (87.3%) as a group member. Of these 241 co-authored papers published, 92 were two-authored, 96 were three-authored, and 38 were four-authored. Moreover, there are 5 five-authored papers, 6 six-authored papers, 3 seven-authored and one, 9-authored papers. In general, 2 and 3-authored papers are more common. Meanwhile, Glänzel was the first or the corresponding author in 33.19 percent of the group documents, and he has collaborated in the other 66.80 percent as a co-author.

Wolfgang Glänzel, as a leading inspiring scientometric researcher, published all his 276 papers in 40 journals. Figure 4 lists the journals that published the most papers authored or co-authored by Professor Glanzel. He published 164 papers in

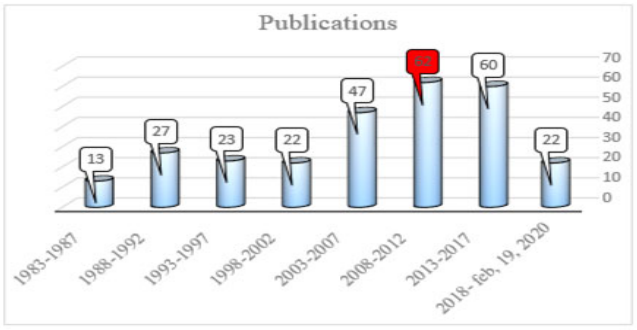

Fig. 1 — Papers by Wolfgang Glänzel

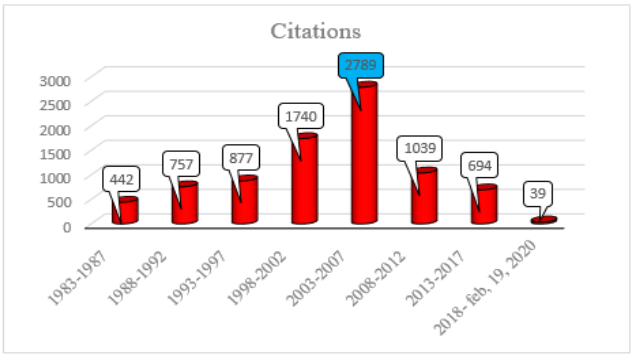

Fig. 2 — Number of citations received by Wolfgang Glänzel

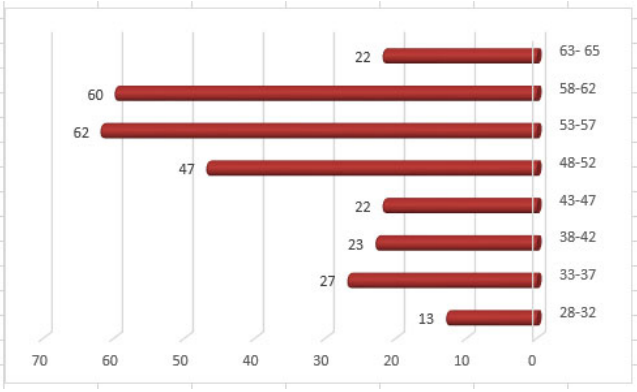

Fig. 3 — Research trends of Wolfgang Glänzel by age

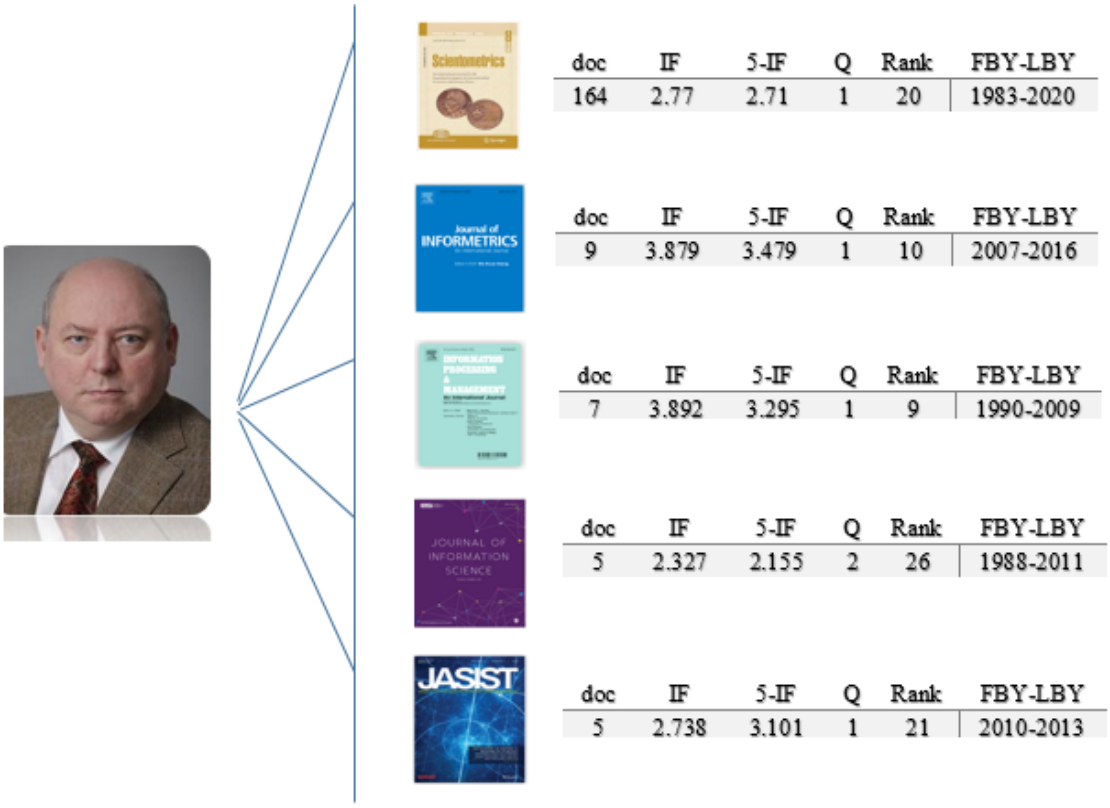

Fig. 4 — Ranking of the channels of communication used by Wolfgang Glänzel

Scientometrics. On the other hand, 6163 of all the 8647 citations received by his documents are related to those published in *Scientometrics*. It is followed by the *Journal of Informetrics* and *Information Processing & Management* journal respectively in which he has published 9 and 7 documents respectively. Furthermore, the *Journal of the Association for Information Science and Technology* and the *Journal of Information Science* had 5 documents each authored or co-authored by the given researcher.

Table 1 presents a list of the 11 most-cited documents published by Wolfgang Glänzel. Among these most-cited documents, the article entitled "*National characteristics in international scientific co-authorship relations*" published in 2001 has received the most citations (399 times cited) published in *Scientometrics*. Among Glänzel's 11 most-cited documents, nine of them were published in *Scientometrics*, and the two in *Library Trends* and *Information Processing & Management*.

Table 2 and Figure 5 show the network of Wolfgang Glänzel's most prolific scientific collaborators and co-authors. This network is composed of researchers who have collaborated with him in at least two articles. As detailed in Table 2 and Figure 5, Glänzel had most collaborations with Schubert, Thijs, Braun, Zhang, Debackere, De Moor and Janssens. This group of researchers is also observed in the centre of the network and near Glänzel. Wolfgang Glänzel has respectively co-authored 68, 58, 46, 21, 15, 15 and 14 documents with Schubert, Thijs, Braun, Zhang, Debackere, De Moor and Janssens.

Moreover, Figure 5 also indicate that the research duo of Glänzel-Schubert from the Hungarian Academy of Sciences, Glänzel-Thijs from the KU Leuven, Glänzel-Braun from the Hungarian Academy of Sciences and Glänzel-Zhang from the KU Leuven in Belgium and the North China University of Water Conservancy and Electric Power had most scientific and co-authorship collaborations during his research career.

Prominent scientists and researchers were involved in the collaboration network of Glänzel. Ronald Rousseau, Henk Moed, Martin Meyer, Olle Persson, Koenraad Debackere, Judit Bar-Ilan, Bart De Moor, and Stefan Hornbostel have been observed in the

Table 1 — List of documents most-cited contributed by Wolfgang Glänzel

Title	Journal	Year	No. of Authors	Global Citation Score
National characteristics in international scientific co-authorship relations	*Scientometrics*	2001	1	399
A Hirsch-type index for journals	*Scientometrics*	2006	3	341
Journal impact measures in bibliometric research	*Scientometrics*	2002	2	322
Inflationary bibliometric values: The role of scientific collaboration and the need for relative indicators in evaluative studies	*Scientometrics*	2004	3	284
Scientometric datafiles - a comprehensive set of indicators on 2649 journals and 96 countries in all major science fields and subfields 1981-1985	*Scientometrics*	1989	3	222
A new classification scheme of science fields and subfields designed for scientometric evaluation purposes	*Scientometrics*	2003	2	219
Science in Brazil. Part 1: A macro-level comparative study	*Scientometrics*	2006	3	201
Co-authorship patterns and trends in the sciences (1980-1998): A bibliometric study with implications for database indexing and search strategies	*Library Trends*	2002	1	186
Double effort = Double impact? A critical view at international co-authorship in chemistry	*Scientometrics*	2001	2	156
A bibliometric study of reference literature in the sciences and social sciences	*Information Processing & Management*	1999	2	155
On the h-index - A mathematical approach to a new measure of publication activity and citation impact	*Scientometrics*	2006	1	146

Table 2 — Research teams of Wolfgang Glänzel

Authors	No. of documents
Schubert A	68
Thijs B	58
Braun T	46
Zhang L	21
Debackere K	15
De Moor B	15
Janssens F	14
Chi, PS	11
Liu, XH	10
Gorraiz, J	9
Schoepflin U	9
Rousseau R	6
Czerwon HJ	5
Gal D	5
Gumpenberger C	5
Meyer M	5
Schlemmer B	5

co-authorship network of Glänzel, those respectively affiliated with universities and institutes of the KU Leuven, Sapienza of Rome, Leiden in the Netherlands and the Elsevier Institute, Aberdeen of Scotland, Amoe in Sweden, KU Leuven, Bar-Ilan University of Israel, KU Leuven, Humboldt Berlin, etc. It is worth noting that some Glänzel fellow researchers, such as Tibor Braun, Andreas Schubert, Henk Moed, Ronald Rousseau, Olle Persson, and Judit Bar-Ilan, were honoured to receive the Derek John de Solla Price Award.

Figure 6 and Table 3 indicate the most frequent partner organizations as well as the organizational collaboration network created or collaborated by Professor Glänzel. Institutions collaboration for at least two documents have been presented. Interestingly, the graphs on Figure 6 and the analysis of the data presented in Table 3 reveal that many the researcher's publications were the results of scientific collaboration with researchers from the Hungarian Academy of Sciences and the KU Leuven in Belgium.

Furthermore, institutions including the Eötvös Loránd University, Research Association for Science Communication and Information, and the North China University of Water Conservancy and Electric Power have institutional collaborations with Glänzel.

Reviewing Glänzel's international involvement or collaboration in Figure 7 and Table 4, it is seen that Glänzel mainly affiliated with the KU Leuven in Belgium, has developed scientific collaborations with researchers from 24 countries during his 37 years of scientific activity. Moreover, Glänzel's scientific collaboration network reveals that most collaborators are from European countries, so that he has had the highest amounts of scientific collaboration with those from Hungary and Belgium.

Glänzel has collaborated with authors from Hungary, Belgium, Germany and China in 216, 185, 41, and 33 documents, respectively. Furthermore, the

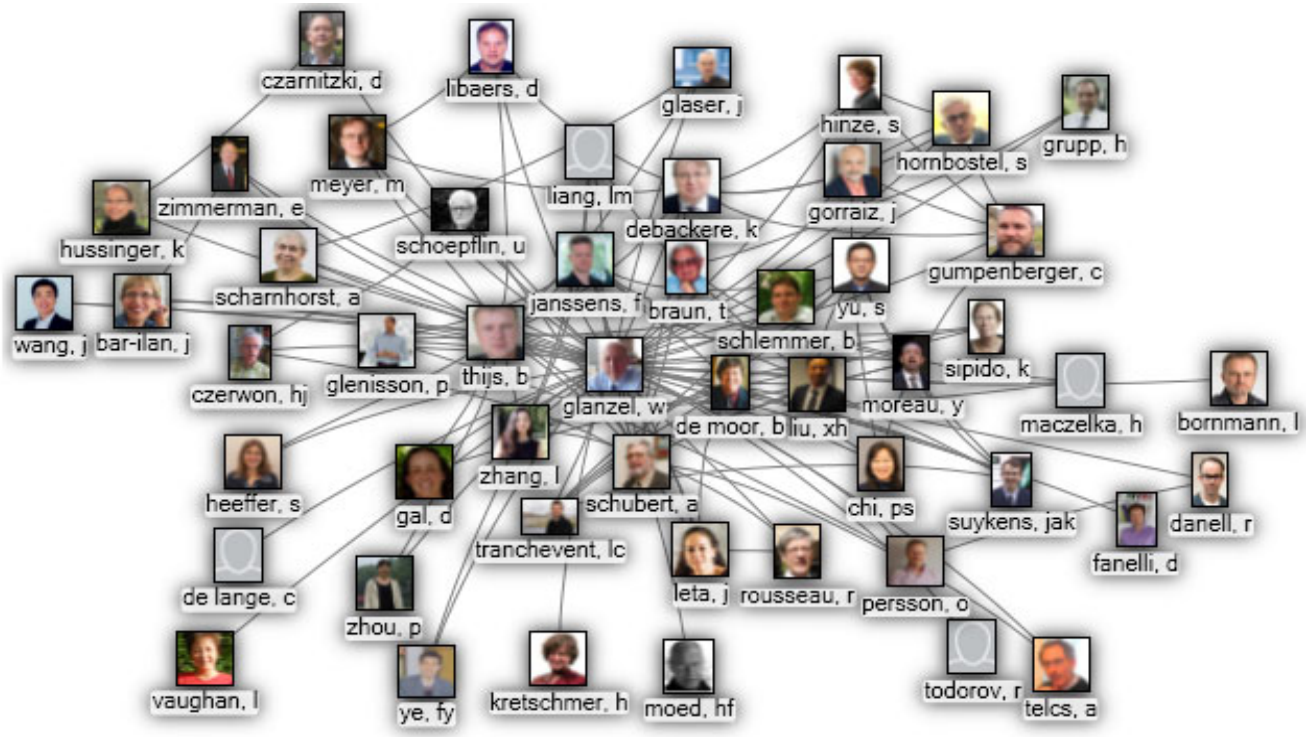

Fig. 5 — Scientific collaboration network of Wolfgang Glänzel

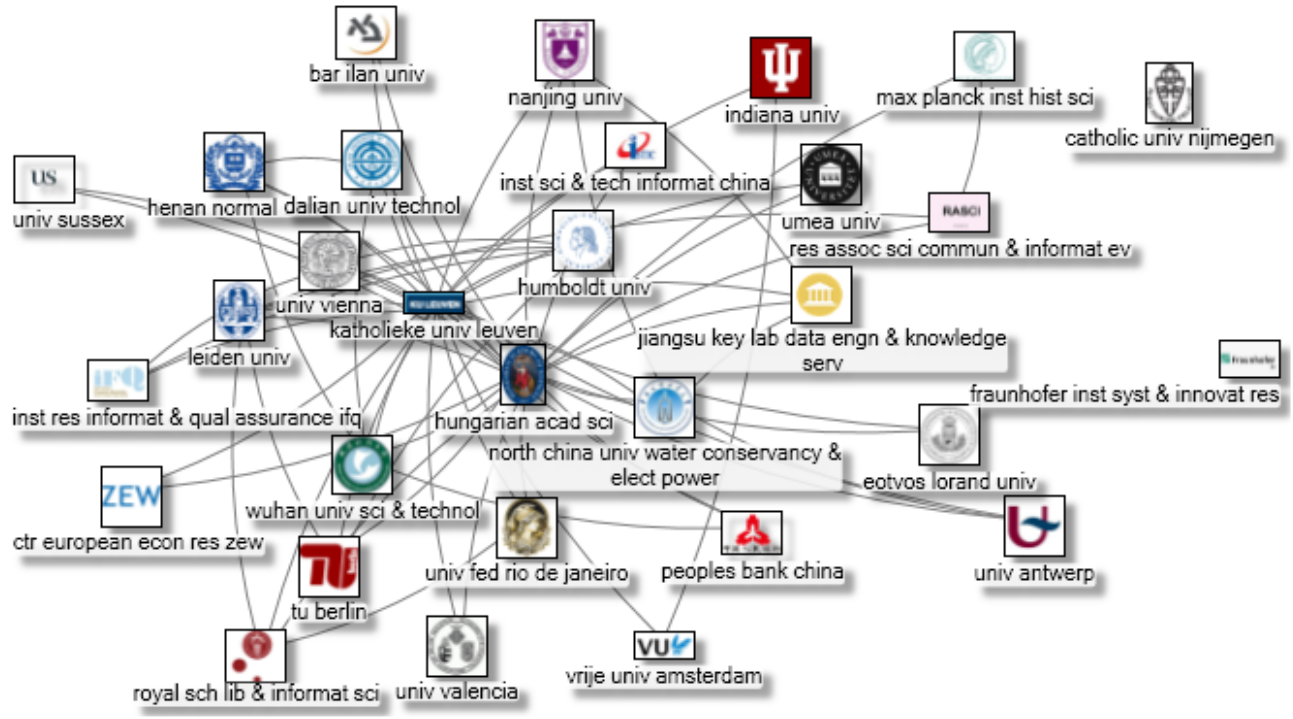

Fig. 6 — Institutions that have the most scientific collaborations with Wolfgang Glänzel

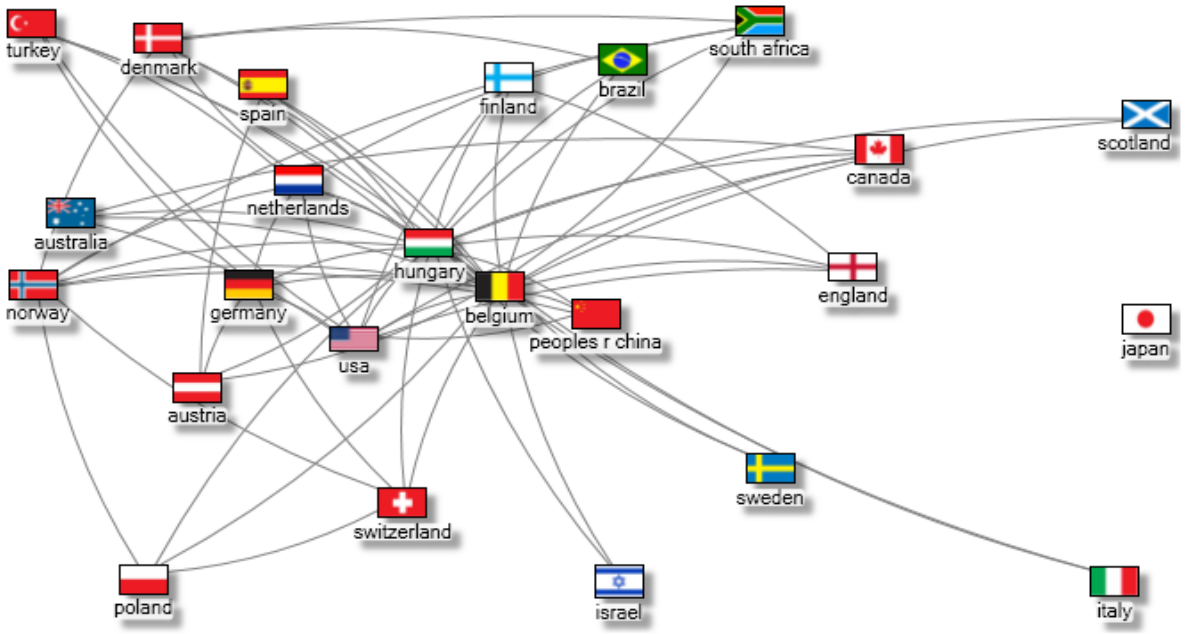

Fig. 7 — Countries that have the most scientific collaboration with Prof Wolfgang Glänzel

Table 3—Top institutes where their researchers collaborating with Wolfgang Glänzel

Institution	No. of documents
Hungarian Academy of Sciences	208
KU Leuven	184
Eötvös Loránd University	19
Research Association for Science Communication and Information (RASCI), (Berlin, Germany)	19
North China University of Water Conservancy and Electric Power	15
Max Planck Institute for the History of Science	11
University of Vienna	9
Dalian University of Technology	6
Wuhan University of Science Technology	6
LHAS	5

Table 4 — Top countries where their researchers collaborating with Wolfgang Glänzel

Country	No. of documents
Hungary	216
Belgium	185
Germany	41
China	33
Netherlands	12
USA	11
Austria	10
Brazil	4
England	4
Spain	4
Sweden	4
Finland	3
Norway	3
Switzerland	3

proximity of Hungary, Belgium, Germany, China, the Netherlands and the United States to each other as seen in Figure 7 demonstrates that Glänzel worked in some of these countries (Hungary, Belgium and Germany) and had several scientific co-authorships with researchers from these countries. In addition to the countries listed in Table 4, further countries from Eastern Europe, Western Europe, North America, South America, Nordic countries, East Asia, the Middle East, Oceania and South Africa are present among Glänzel collaborating countries.

Ideational influence of a researcher is calculated by counting the number of citations given to and received from other researchers[22,23]. It is important to determine to what extent a researcher may be influenced by other researchers' ideas and thoughts, and to what extent s/he can influence their ideas and

thoughts[24]. Where a researcher commonly uses the works produced by specific researchers, there can be many reasons for such references or citations. Among such reasons, the reputation of a researcher in a given field, the closeness of thoughts and ideas of the referenced and referencing researcher, and the importance of the referenced works in that subject area field can be considered the main ones.

As Figure 8 shows, Glänzel has been respectively influenced by the ideas of prominent scholars such as Tibor Braun, András Schubert, Eugene Garfield, Loet Leydesdorff, and Frizo Janssens, and he stands on the shoulders of these giants based on Web of Science. On the other hand, citing researchers like Loet Leydesdorff, Mike Thelwall, Lutz Bornmann, András Schubert and Ronald Rousseau have been influenced by Glänzel's ideas and thoughts.

In other words, it can be generally said that an interaction or mutual influence has occurred between scientific duos such as Glänzel-Schubert and Glänzel-Leydesdorff because they have reciprocally read and cited each other's works. The interesting point is that among those who have influenced Glänzel or have been influenced by him, there are researchers who have been honoured to receive the Derek John de Solla Price Award. In other words, four authors (other than Frizo Janssens) who influenced Glanzel received the Derek John de Solla Price Award between 1984 and 2003 and all the researchers influenced by Glänzel thoughts were also honoured to receive the Award.

Table 5 shows co-authors of Glänzel based on ideational influence indicators. We reviewed the most influential researchers with whom Glänzel established the most scientific collaborations. Based on ideational influence indicators analysing the data with the help of the Publish or Perish software, it is observed that Glänzel co-authorship teams and research groups, including Bart De Moor and András Schubert, Bart Thijs, Koenraad Debackere, Tibor Braun and Lin Zhang, have a better position than others mentioned. Put differently, Professor Glänzel is of the most influential, established high scientific interactions with outstanding peers, in scientometrics with an H-index of 55, a G-index of 80 and an HC-index of 24.

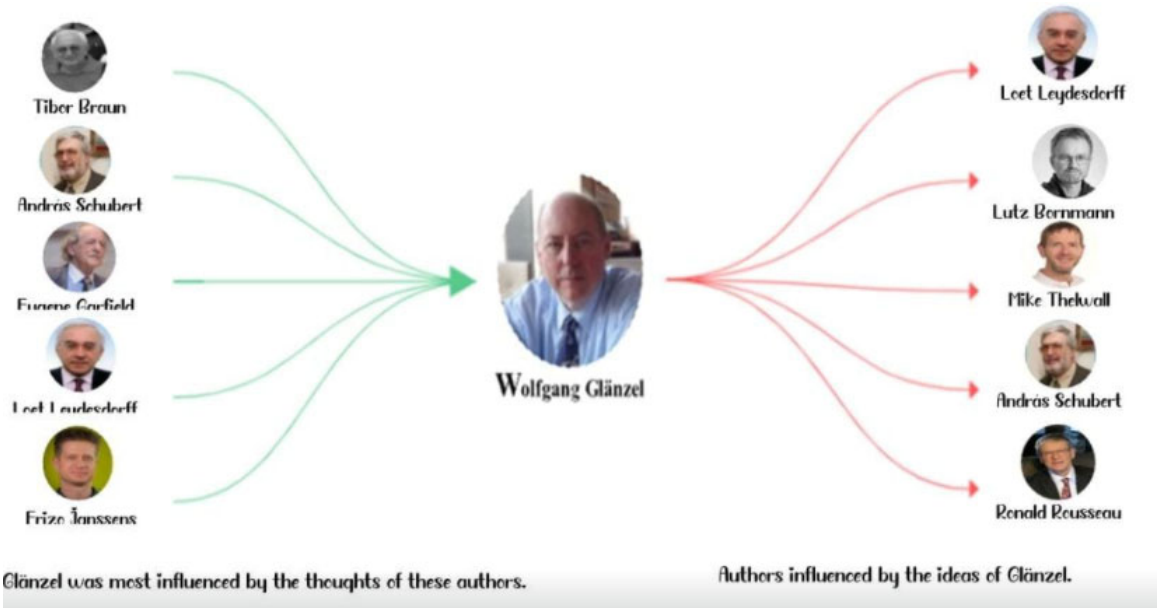

Fig. 8 — Influential and effective network of Wolfgang Glänzel

Table 5 — Glänzel's collaborators based on influence of thought influence indexes

Author	H-Index	Author	G-Index	Author	Hc-Index
De Moor B	37	Schubert A	74	De Moor B	23
Schubert A	36	De Moor B	65	Schubert A	17
Thijs B	17	Thijs B	28	Thijs B	13
Debackere K	15	Debackere K	28	Debackere K	13
Braun T	12	Braun T	23	Zhang L	9
Zhang L	11	Zhang L	18	Braun T	7

Fig. 9 — Keywords assigned to articles published by Wolfgang Glänzel

Figure 9 shows the words most frequently used and repeated in Glänzel studies during his 37 years of scientific activity. Based on this, it was determined that words, including hybrid clustering, citation impact, text mining, core document, h-index, bibliometric analysis, scientometric indicators, altmetrics, characteristic scores and scale, price index, patent citation, bibliographic coupling, mapping of science, cluster analysis, scientific collaboration, network analysis, international collaboration, and other emerging topics were more frequent in Glänzel's papers. Therefore, it can be stated that the studies and investigations conducted by this influential researcher of the KU Leuven Belgium, have mainly focused on such topics or themes over the years.

Conclusion

Scientometric portraits and biographical bibliometrics are enlightening and inspirational because they can show the progression of a researcher's career. Based on this scientometric portrait of Professor Wolfgang Glänzel, it can be concluded that he is a collaborative researcher with strong scholarly communication and co-authorship, collaborating with over 100 researchers from different countries, especially from Europe. He has been influenced by prominent researchers in the field of scientometrics and has influenced scientometricians. His research career can be considered as a role model for junior researchers. He received the Derek de Solla Price Memorial Award, the Junior Scientist Award of the Hungarian Academy of Sciences and other awards; but he never stopped his research and academic writing. For example, he published more than 65 percent of his publications in the years 2008-2017 as aged 53 to 62 years old. He has contributed substantially to develop scientific knowledge and enrich the quantitative field of metrics (information metrics), especially bibliometrics, scientometrics and quantitative studies in science.

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