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## Scientific Transition from Chemistry to Information and Communication Sciences: A Tribute to Professor Henri Dou, a Pioneer of Competitive Intelligence in France

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### ABSTRACT

**Objective:** This study is a tribute to Professor Henri Dou, President of the Scientific Council of the Academy of Economic Intelligence in Paris and Distinguished Professor of Information and Communication Sciences at Aix-Marseille University, France. This tribute shows his legacy and influence in the scientific field.

**Materials and Methods:** The present research is a scientometric analysis of all documents published by Professor Henri Dou and indexed in the Scopus database. We used the capabilities of Bibliometrix R Package, VOSviewer, and Excel software to analyze the data.

**Results:** The publication trend of Professor Dou was a sinusoidal trend. During his scientific career, he has been able to collaborate with researchers from 11 countries, which shows his attention to the issue of science diplomacy. In addition to international collaborations, this distinguished professor has paid special attention to national collaboration and intra-organizational collaboration, so most of his scientific activities have been with French researchers and researchers at Aix-Marseille University. The subject areas of innovation, competitive intelligence, and invention analysis have been among the topics of interest of this distinguished professor.

**Conclusion:** This study shows the scientific portrait, scientific diplomacy, and international cooperation of Professor Henri Dou with other researchers and better depicts the research fields studied by him.

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## Introduction

Scientific transition is the process by which a researcher or scientist adopts the scientific outward or personal characteristics that match his/her research interests, as opposed to those associated with his/her former research interests. The main objective of the current scientometric portrait was to evaluate the research performance and scientific legacy of Henri Dou during his profession from 1965 to 2023.

Henri Dou first graduated as an engineer at IPSOI (Institut de Pétrochimie et de Synthèse Organique Industrielle). He obtained his Ph.D. degree in chemistry at the University of Aix Marseille in cooperation with the University of Antigonish in Canada. Henri is a pioneer of *competitive intelligence* and *technical intelligence* in France, as well as *regional and territorial development*. After a career as the Director of Research at the CNRS (National Scientific Research Centre) in chemistry, he became a university professor in information science and developed a large international program of *technology watch* and *competitive intelligence* with Brazil, Malaysia, Indonesia, and France. During his academic career, he was the Director of a NATO Institute, General Secretary of the CHIN of UNESCO (Chemistry International Network), French representative at the International Oceanographic Commission, auditor of the IHEDN (Institut des Hautes Etudes de la Defense Nationale), and Expert near the Court of Appeal and in charge of various tasks for the Direction of CNRS. He was a professor of information science at the Aix-Marseille University, Faculty of Sciences and Technology of Saint Jérôme, Department of Information Science and he was also the Director of the CRRM laboratory.

He was the Director of Atelis, a strategic intelligence work-room of a French Business School (France), and consultant for the WIPO (World International Patent Organization), the OAPI (African Organization of Intellectual Property), and an expert near the World Bank Group and the European Community. He comes with extensive experience both in academic and non-academic positions around the world. He is also presently the Research and Honorary Professor at different universities in China and was an associate member of the CESER (Conseil Economique Social et Environnemental Régional PACA), and a member of the IAB (International Advisory Board) of the Ministry of Science and Technology of Vietnam. He is one of the pioneers of *competitive intelligence* in France, Brazil, and Indonesia and has put his experience to the benefit of such organizations as the European Commission, UNESCO, NATO, and the CNRS (the French National Centre for Scientific Research). He is also active as a consultant for various enterprises and institutions in France and abroad. Today, he is the President of the Scientific Council of the Academia of Economic and Strategic Intelligence (Paris – France).

In this section, we review the main literature conducted by the bio-bibliometric method. The following studies were identified as relevant literatures: *Analyzing the legacy and scientific impact of Saeed-Ul Hassan: A Pakistani scientometrician, data scientist and winner of the Eugene*

*Garfield Award 2017 and 2022* (Nawaz et al., 2023); *Bio-bibliometric portrait of Mauro Guerrini: An Italian specialist in knowledge organization and cataloguing* (Noruzi et al., 2022), *Scientometric portrait of professor Wolfgang Glänzel: An expert in the field of scientometrics* (Gholampour & Noruzi, 2021), *A scientometric portrait of Daniel Funk: Publication productivity, collaboration patterns, and citation analysis* (Elahi, Gholampour & Dickson, 2021), *Commemorating Judit Bar-Ilan from bibliometric and altmetric perspectives* (Haustein & Peters, 2020), *The scientific legacy of Judit Bar-Ilan* (Halevi, 2020), *The altmetrics of Henk Moed's publications* (Bar-Ilan & Halevi, 2020), *Historical roots of Judit Bar-Ilan's research: A cited-references analysis using CReXplorer* (Bornmann & Leydesdorff, 2020), *Garfield number: On some characteristics of Eugene Garfield's first and second order co-authorship networks* (Glänzel & Abdulhayoğlu, 2018), and *Judit Bar-Ilan: Information scientist, computer scientist, scientometrician* (Thelwall, 2017).

## Materials and Methods

To conduct scientometric research, the search strategy and data retrieval are the main parts of the research; so if the data retrieval is done correctly, the work of analyzing and drawing conclusions from the data will be accurate and targeted. The current research uses the Scopus database as a data retrieval platform. This bibliographic database is among the largest and most reliable citation indexes in the world due to the wide coverage of scientific journals and publications compared to its counterpart Web of Science (WoS). Scopus is also frequently used in bibliometric and scientometric studies because of its valuable resources and the high importance of results.

### Data Retrieval

The combination of AU-ID, AUTH, ORCID, and OR operator was used to retrieve the data. The search command is provided below.

```
AU-ID("7005674622") OR AUTH("Dou, Henri") OR ORCID("0000-0002-2990-5589")
```

The search process was such that all the publications (75 documents) of Professor Henri Dou were extracted from this database on May 25, 2023, without limitation on language, document type, and year.

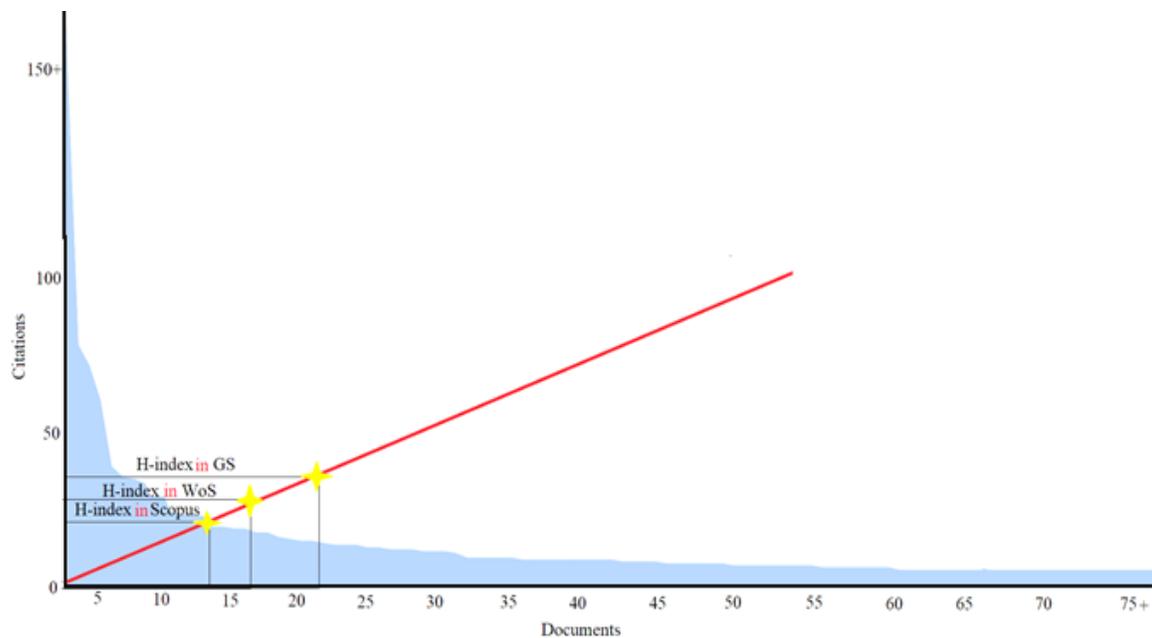
### Data Analysis

Bibliometrix R Package and VOSviewer scientometric software were used to analyze the results. Also, the capabilities of Excel software and Scopus results analysis section were used for some results. Information about authors, institutions and collaboration countries, and publishing channels interested in Professor Dou, the trend of his publications by year, and thematic areas were used from Bibliometrix R Package software capabilities. To draw his collaboration network, the VOSviewer software capabilities were used.

## Results and Discussions

### *The impact and research trend of Henri Dou*

To show the scientific influence of Henri Dou in the scientific field, his h-index status in three citation databases Google Scholar (GS), Scopus, and Web of Science (WoS) is shown in Figure 1. As it is clear, the h-index of this prominent professor of Aix-Marseille University in France was 22 in Google Scholar, 13 in Scopus and 16 in Web of Science. It is worth noting that the number of publications of this distinguished professor in Scopus is 75 documents and 662 citations and his number of documents in Google Scholar is 652 and 2,687 citations. On average, each of his articles has received 8.69 citations in Scopus and 4.12 citations in Google Scholar.



**Figure 1. H-index Professor Guerrini on Google Scholar, Scopus, and WoS**

The publications trend of Henri Dou in Scopus has a sinusoidal trend. As shown in Figure 2, the highest number of publications of this prominent researcher of Aix-Marseille University was in 1976, 1985, and 2013 with the publication of 4 documents. As can be seen, the peak of this researcher's practical activity dates back to the last three decades of the 20th century. During this period of time, Professor Dou has published 59 documents in the journals covered by Scopus, something equivalent to 78 percent of his total publications related to this period. Henri has not been able to repeat this scientific development in the 21<sup>st</sup> century and the number of his publications has decreased. In other words, 21 percent of his publications are realized in the 21st century. It may be claimed that this decrease in publication can be due to his old age and involvement in executive activities on the one hand, and on the other hand, it is due to the focus of this research only on his publications in the Scopus database.

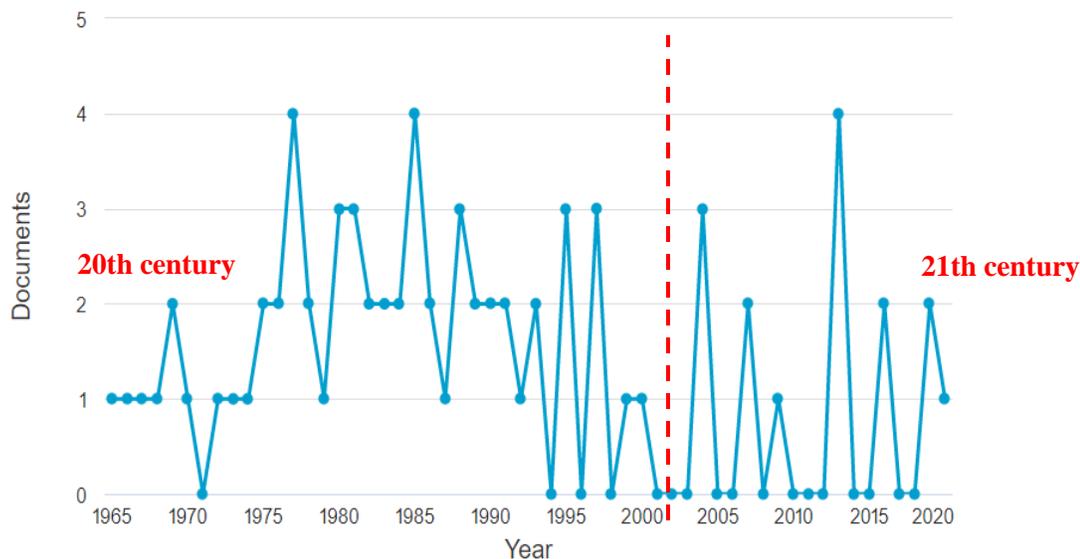
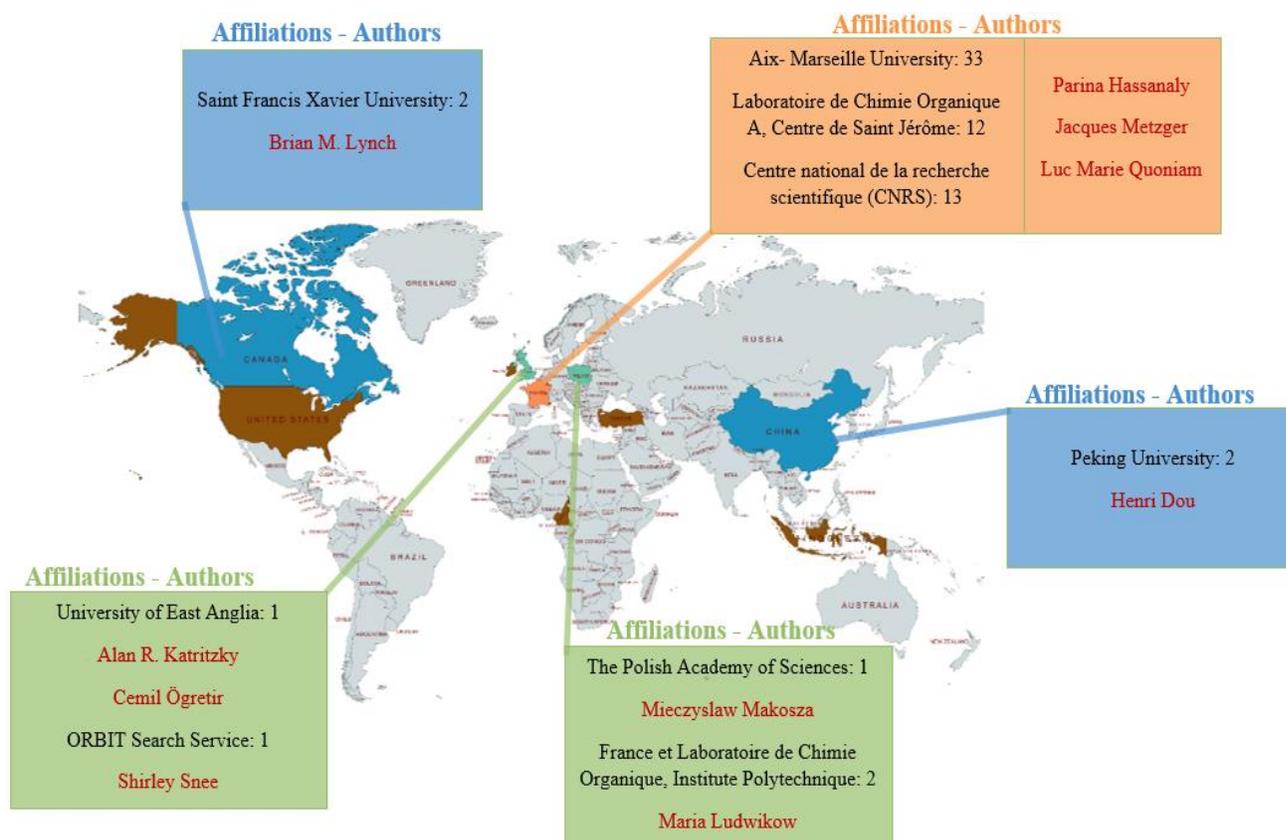


Figure 2. The number of documents published per year by Henri Dou

### *The collaboration network of in publication Henri Dou*

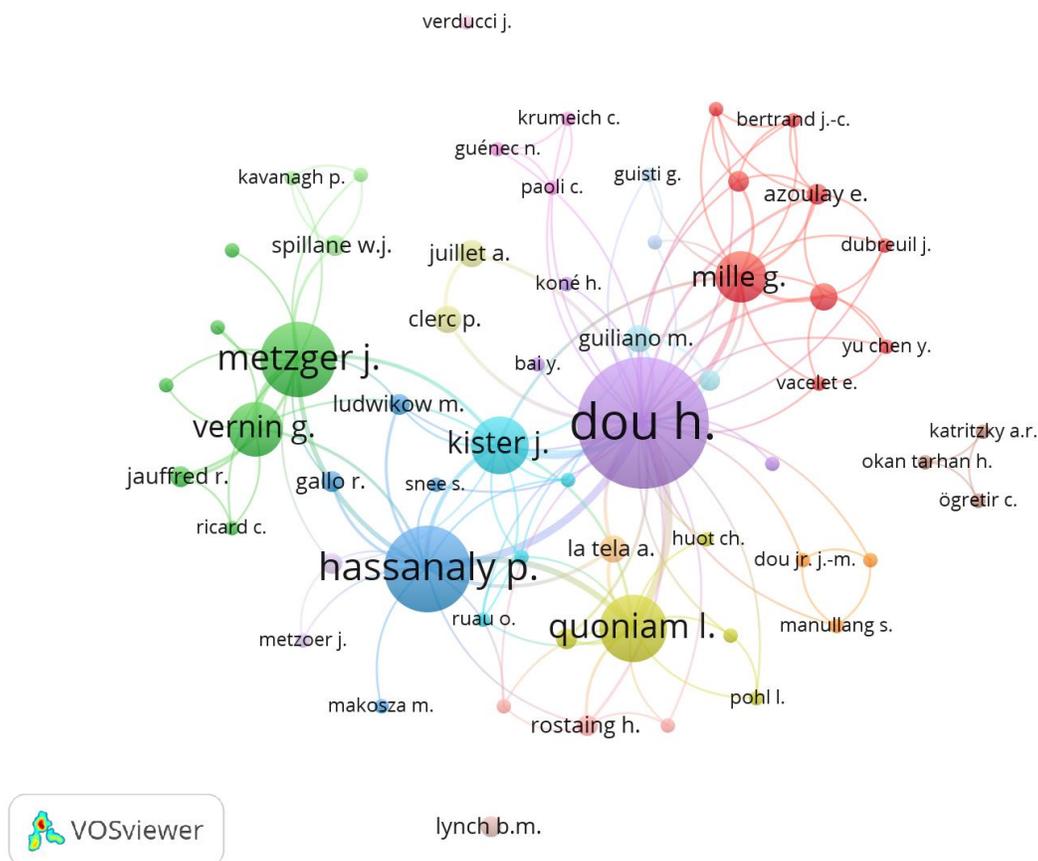
The geographical map of Professor Dou's publications in Scopus shows that this prominent French researcher during his practical activity was able to collaborate scientifically with 60 researchers from 11 countries (see Figure 3). This professor of the Aix-Marseille University has paid special attention to collaboration with French researchers so 83 percent of his publications have been with the researchers of France. However, Professor Dou paid a lot of attention to international collaboration and the status of his collaboration shows his attention to this issue. Dou knows very well that the world of science and science diplomacy have no boundaries and to improve his research, he must use all the potentials available everywhere in the world and benefit from the advice of all the scientists in the world. After France, he had more scientific collaborations with institutions in England, Poland, Canada, and China.

In England, he has done scientific collaborations with the *University of East Anglia* and *ORBIT Search Service* and researchers like Alan R. Katritzky, Cemil Ögretir, and Shirley Snee. In Poland and France, he had the most research cooperation with researchers such as Mieczyslaw Makosza and Maria Ludwikow at *The Polish Academy of Sciences* and the *Laboratoire de Chimie Organique* and *Institute Polytechnique* of France. In Canada, *Saint Francis Xavier University* and Brian M. Lynch were the most involved in the publications of Professor Dou in Scopus. It is worth noting that Henri Dou published two articles under the organizational name of *Peking University*. However, in France, it is *Aix-Marseille University*, *Laboratoire de Chimie Organique A*, *Center de Saint Jérôme* and *Center national de la recherche scientifique (CNRS)* and researchers such as Parina Hassanaly, Jacques Metzger, and Luc Marie Quoniam who collaborated the most with Professor Dou.



**Figure 3. Scientific map of the collaboration of Henri Dou with other countries and institutes**

Figure 4 shows the scientific collaboration network of Professor Henri Dou. Nodes represent researchers and links represent scientific collaboration between researchers (Elahi, Gholampour & Gholampour, 2020; Gholampour, Gholampour & Noruzi, 2022). This researcher of the Aix-Marseille University has had scientific collaborations with 60 researchers during his scientific activity. The network of scientific collaborations of Henri Dou indicates the fact that he had the most scientific contact with Parina Hassanaly, Jacques Metzger, and Luc Marie Quoniam, and this can be seen from the thickness of the bond between them. In addition, the size of the node of these researchers compared to other researchers shows the number of documents they share with Professor Dou.



**Figure 4. Co-authorship Network of Henri Dou**

***The most prolific authors, countries, institutions, and journals in publication Henri Dou***

Table 1 presents Henri Dou's main collaborators. As it is clear in Table 1, the 11 researchers were more pioneers than other researchers in collaborating with Henri Dou. Professor Parina Hassanalyp from *Aix-Marseille University*, Professor Jacques V. Metzger in *Chemistry* at the *University of Aix Marseille III*, and Professor Luc Quoniam from the *Federal University of Mato Grosso do Sul*, hold the first to third positions. After that, Jacky Kister, Gaston A. Vernin, and Gilbert Mille are in the next ranks. In the international dimension, Henri Dou has collaborated more with researchers from the UK and Poland. His research collaborations in the Americas continent were from Canada and the USA, in Europe from the UK, Poland, Luxembourg, Monaco, and Ireland, in Asia from Indonesia, Turkey, and in Africa from Cameroon. It is important to note that the peak of his scientific collaborations was with French researchers so 83 percent of his collaborations were with French researchers.

As the results show, Professor Dou has paid special attention to intra-organizational collaborations, so nearly half of his publications have been with researchers from Aix-Marseille University, Laboratoire de Chimie Organique A, Centre de Saint Jérôme, and Centre national de la

recherche scientifique (CNRS). The scientific publications of Henri Dou have been published in more than 40 journals, including *World Patent Information*, *Tetrahedron Letters*, *Journal of Heterocyclic Chemistry*, *Scientometrics*, *Education for Information*, *International Journal of Environmental Analytical Chemistry*, *Journal of the Chemical Society*, *Perkin Transactions 2*, and *Marine Environmental Research*. These journals were the most important publishing channels of Henri Dou and his team.

**Table 1. Top 12 leading authors, countries, institutions, and journals in publications Henri Dou**

#	Authors	TP	Countries	TP	Institutions	TP	Journals	TP
1	Hassanaly, P	25	France	62	Aix Marseille University	35	World Patent Information	7
2	Metzger, J. V	18	UK	3	Centre National de la Recherche Scientifique (CNRS)	12	Tetrahedron Letters	6
3	Quoniam, L	14	Poland	3	Laboratoire de Chimie Organique A, Center de Saint Jérôme	11	Journal of Heterocyclic Chemistry	5
4	Kister, J	12	Canada	2	École supérieure de commerce et management (ESEM)	3	Scientometrics	4
5	Vernin, G	11	China	2	Centre de Recherche Rétrospective de Marseille	2	Education For Information	3
6	Mille, G	10	Ireland	1	Institut Polytechnique de Paris	2	International Journal of Environmental Analytical Chemistry	3
7	Guiliano, M	4	USA	1	Institut Méditerranéen d'Océanologie	2	Journal of the Chemical Society, Perkin Transactions 2	3
8	Giusti, G	3	Cameroon	1	Peking University	2	Marine Environmental Research	3
9	Clerc, P	3	Indonesia	1	Saint Francis Xavier University	2	Research Evaluation	2
10	Juillet, A	3	Monaco	1	France et Laboratoire de Chimie Organique, Institute Polytechnique	2	Tetrahedron	2
11	La Tela A	3	Turkey	1			Journal of Organic Chemistry	2
12	Gallo, R. J	3	Luxembourg	1			Journal of Chemical Information and Computer Sciences	2

The status of Professor Dou's collaborations with researchers indicates that he started his scientific activity with Professor Parina Hassanaly in 1975 with the article entitled "*Homolytic aromatic substitution by heterocyclic free radicals. Reaction of 3-quinolyl and 8-quinolyl radicals with aromatic compounds*" and they collaborated until 1993. The peak of the scientific collaboration of these two researchers was in 1977 with three documents. In other words, the scientific activity of these two researchers lasted for nineteen years. Metzger, the second outstanding collaborator of Henri Dou, began his scientific activity with this outstanding researcher of Aix-Marseille University in 1967, and until 1981, this collaboration continued continuously for 15 years. The peak of the collaboration of these two researchers was in 1978-1976.

Professor Jacky Kister, a distinguished researcher at the Aix-Marseille University, collaborated on 12 articles with Professor Dou. The scientific activity of these two researchers began in 1976 with the publication of the article entitled "*Hydrolysis of 1-methyl-2-methylthio- $\Delta$ 2-imidazoline*" and continued until 2016. It is worth noting that the collaboration of these two researchers was not continuous, so in some years they did not have any collaboration, but in other words, these two researchers were able to register the longest scientific collaboration. In other words, the most recent scientific collaboration of Henri Dou was formed with Philippe Clerc and Alain Juillet. He has had scientific collaboration with these researchers in three documents, their scientific collaboration started in 2019 and continued until 2020.

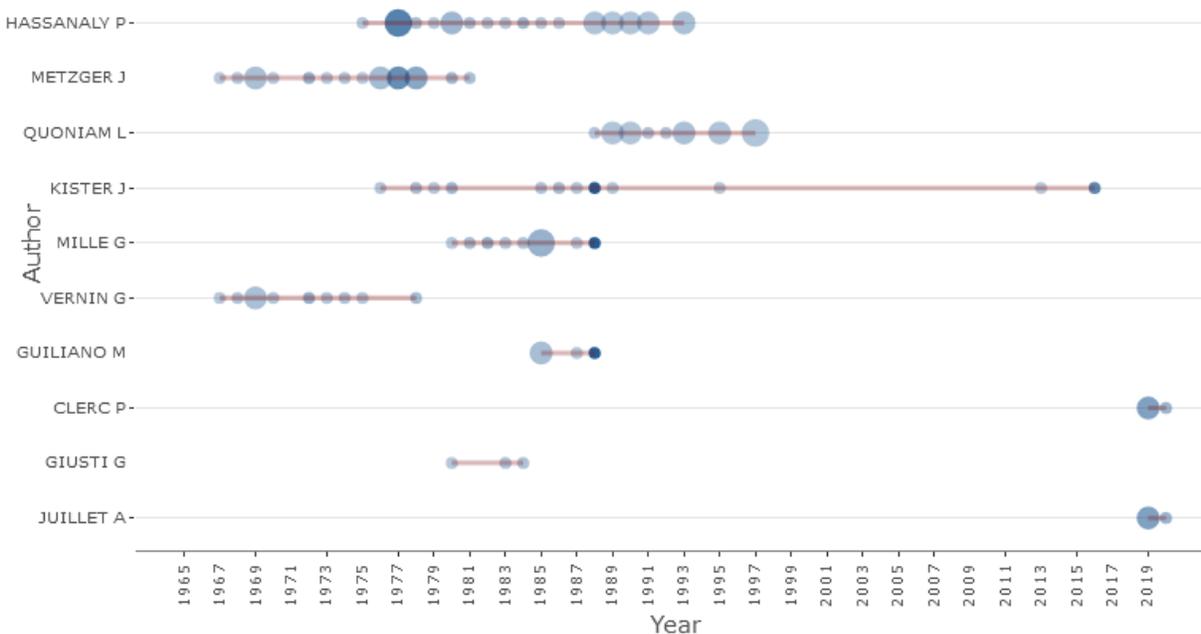


Figure 5. Collaboration network of Henri Dou over time

### *Thematic areas of interest of Henri Dou*

Figure 6 shows the word cloud of keywords used by Henri Dou in the documents. The size and smallness of the nodes indicate the frequency of keywords. Figure 6 shows the research fields of Henri Dou during his scientific career. Keywords such as innovation, competitive intelligence, developing country, patent analysis, bibliometric, automatic analysis, China, Indonesia, agricultural biotechnology, benchmarking, chemical structure, and alkylthio-2 (alkyl, alky 1-1, coal, apa, benzy1) imidazoles, are mostly used by this outstanding researcher. According to the high-frequency keywords of competitive intelligence, it can be concluded that Henri Dou was one of the pioneers of competitive intelligence and technical intelligence in France and had a special focus on research in this field, the size of the keywords speaks for itself. Furthermore, the presence

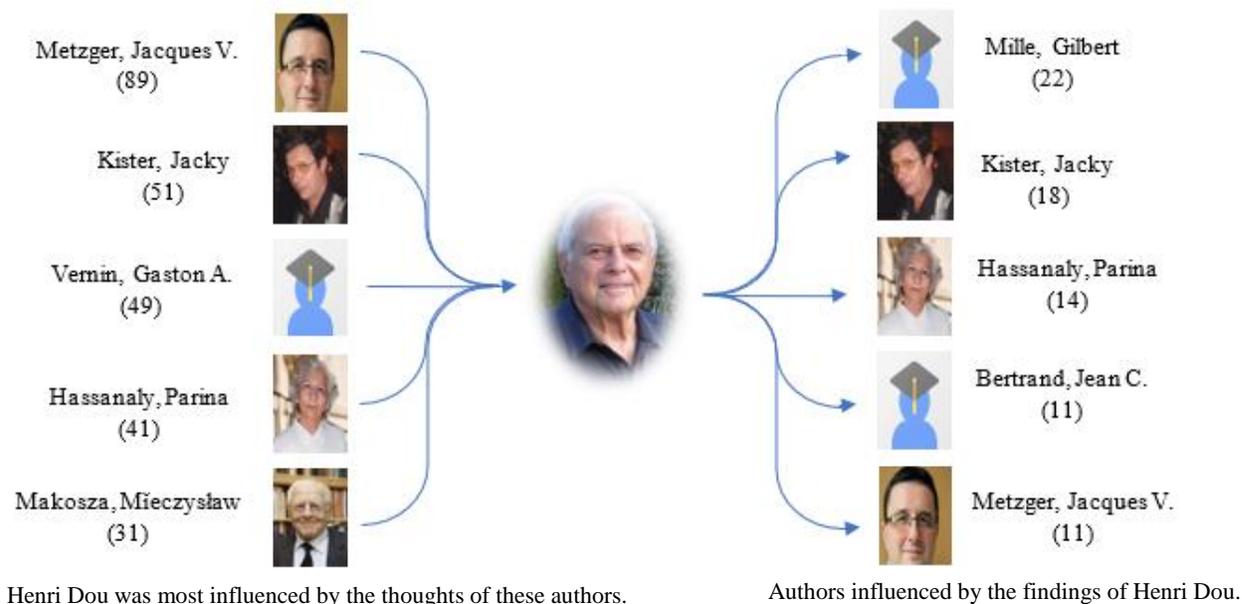
of the Indonesia keyword among the most frequent keywords is because Henri Dou was the developer of the international competitive intelligence program in Indonesia.



Figure 6. Word Cloud of the author keywords

### *The scientific influence of Henri Dou*

Figure 7 shows the status of influenced by (referenced authors by Henri Dou) and influence (authors citing Dou) based on his publications in Scopus. Henri Dou has been influenced by the scientific ideas of more than 150 researchers. This prominent researcher has used 2,226 references to publish 75 of his documents, which shows that he was influenced by the scientific thoughts of these researchers. The scientific documents of Professor Dou have influenced the thoughts of more than 150 researchers during the 58 years of his continuous scientific activity, so his scientific publications have received 662 citations. On the one hand, Figure 7 indicates that Henri Dou was mainly influenced by the ideas of Jacques V. Metzger with 89 references, Jacky Kister with 51 references, Gaston A. Vernin with 49 references, Parina Hassanaly with 41 references, and Mieczysław Makosza with 31 references. They are the main influential authors influencing Henri's studies. On the other hand, this university professor of competitive intelligence and information science of Aix-Marseille University has influenced the scientific ideas of researchers such as Gilbert Mille, Jacky Kister, and Parina Hassanaly by receiving 22, 18, and 14 citations, respectively. Jean C. Bertrand with 11 citations and Jacques V. Metzger with 11 citations, were other researchers who were influenced by the scientific thoughts of Henri Dou.



**Figure 7. The influential and effective network of Henri Dou**

## Conclusion

This research shows the scientific influence, scientific diplomacy, and international cooperation of Professor Henri Dou based on his scientific publications in the Scopus database. This study also reveals the activities of Henri Dou and his scientific behavior to other researchers and provides directions for researchers who want to use his theories and thoughts. It can be stated that this prominent professor has paid special attention to the dimension of national (French researchers) and intra-organizational (Aix-Marseille University researchers) collaboration, and he has published most of his scientific publications with these researchers. He also published most of his scientific findings under the name of Aix-Marseille University. His research team consisted of researchers such as Parina Hassanaly, Jacques V. Metzger, and Luc Quoniam. This prominent researcher has focused on topics such as competitive intelligence, innovation, patent analysis, bibliometrics, etc. Over the years, Professor Dou has sought to apply his knowledge to the development of French information centers and libraries.

## Author Contributions

Conceptualization, A.N., B.G., and S.G.; methodology, B.G., S.G. and J.K.; software, B.G., and S.G.; validation, B.G., and S.G.; and A.N.; formal analysis, A.N., B.G. and S.G.; investigation, B.G., and S.G.; resources, B.G. and S.G.; data curation, B.G., and S.G.; writing—original draft preparation, A.N., B.G., and S.G.; writing—review and editing, A.N., B.G., S.G., and J.K.; visualization, B.G., and S.G.; supervision, A.N. and J.K.; project administration, A.N. and J.K. All authors have read and agreed to the published version of the manuscript.”

## Data Availability Statement

Data can be provided upon request.

## Acknowledgments

This study was conducted in tribute to Professor Henri Dou, a Pioneer of Competitive Intelligence and an expert in Information and Communication Sciences in France.

## Ethical considerations

The authors avoided data fabrication and falsification.

## Conflict of interest

The authors declare no conflicts of interest.

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