

TECHNICAL COMMUNICATION IN ENGINEERING: writing and oral presentation



LESSON 2

Information search and management

2.1 Introduction.

2.2 Aims of information search.

2.3 Where to find information.

2.3.1 Sources of information.

2.3.2 Criteria to determine the quality of the information.

2.4 Tools to search and manage information.

2.4.1 Databases.

2.4.2 Bibliographic managers.



2.1 INTRODUCTION

This lesson presents the objectives and methodologies to search technical and scientific information. This represents the first task to follow to get knowledge in a specific topic. Nowadays, the availability of information is limitless so we need to know how to manage the amount of information and to have criteria to determine its quality, thus getting relevant information.

LEARNING OUTCOMES

At the end of this lesson we expect the student to:

- Identify the main features and relevance of each information source.
- Classify the information based on quality hints.
- Employ several ICTs (information and communication technologies) to get information.
- Manage big amounts of information, collecting specific information about a topic and/or problem.

2.2 AIMS OF INFORMATION SEARCH

- ❑ The first step to gain knowledge about a specific topic is a bibliographic review.

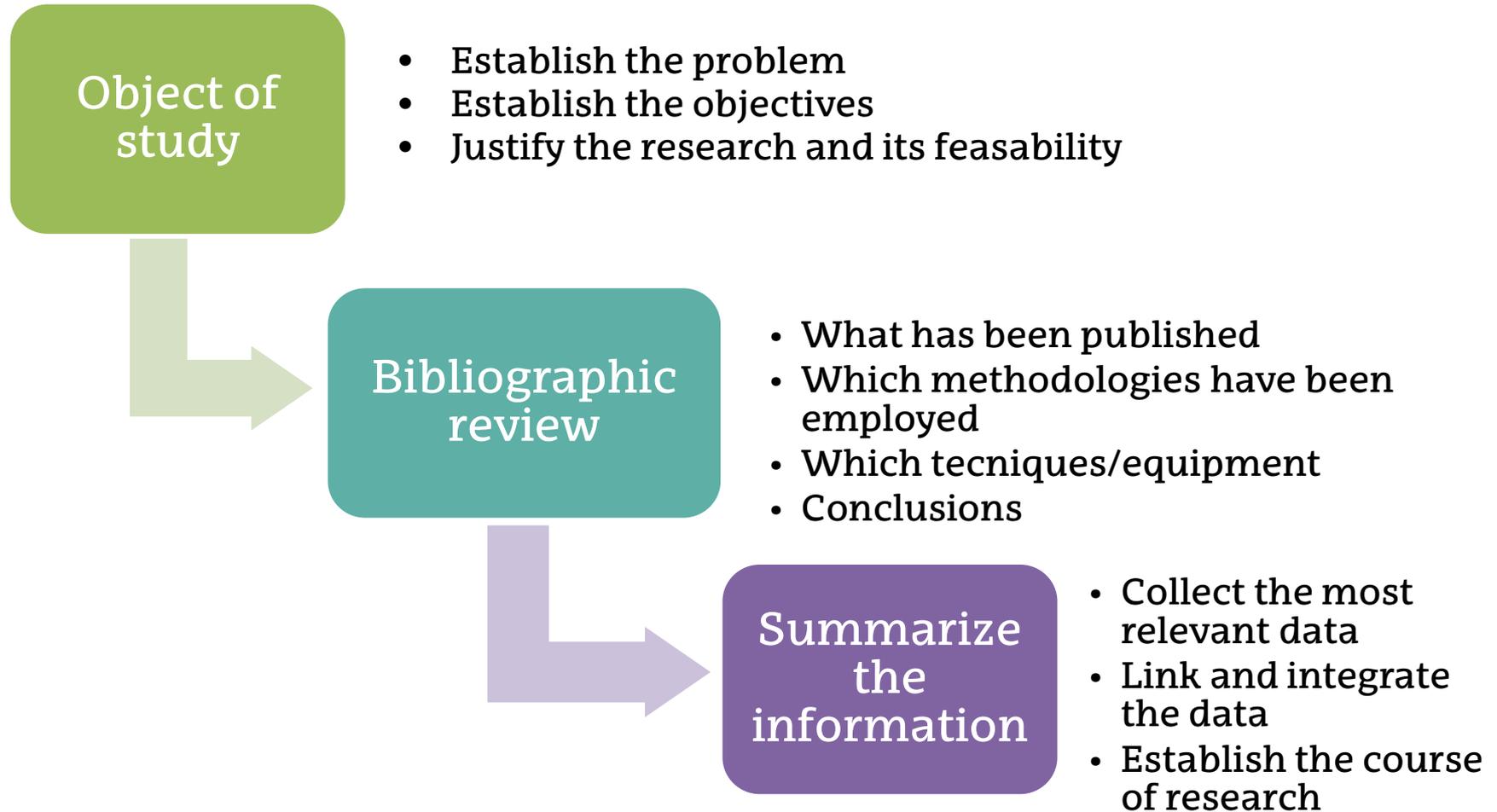
- ❑ **What should I search for?**
 - Previous relevant research studies.
 - The employed theoretic models.
 - Techniques and tools to gather data.
 - Achieved technical findings/developments.

- ❑ **A bibliographic review allows to:**
 - Develop conceptual knowledge.
 - Update yourself on recent technical and conceptual advances.

❑ **Requirements for searching information:**

- To be systematic, rigorous and disciplined.
- To have logical skills, curiosity, ability to summarize, associate ideas and drafting.
- To have English knowledge (the main language employed in science).
- To have criteria to determine the quality of information.
- To have the capacity synthesize, by moving from the current state of the art to development perspectives: set the starting point and the course of research.

- The following scheme shows the steps to perform a high quality bibliographic search:



2.3 WHERE TO FIND INFORMATION

2.3.1 Sources of information

- ❑ The information sources are the studies and products of scientific communication, which can be found in different formats, periodicity and systematicity.

- ❑ We can distinguish between:
 - **PRIMARY SOURCES:** authors provide information on their own research activities. They provide direct and original information related to a specific field of knowledge.

 - **SECONDARY SOURCES:** experts of a specific topic collect and analyze relevant information from a field of knowledge within a particular timeframe. This helps to have an overview of the state of the art in a specific field and to detect the most relevant authors and findings.

SOURCES OF INFORMATION

- ❑ **Books:** they provide extensive information about well-established concepts within a field of knowledge.
 - They require long writing, editing and publishing time (usually more than three years).
 - They are useful as educational material because the speed of publication is of vital importance for professional readers.

- ❑ **PhD theses:** they are research works that have been presented or defended in front of a qualified court to get the doctoral degree.

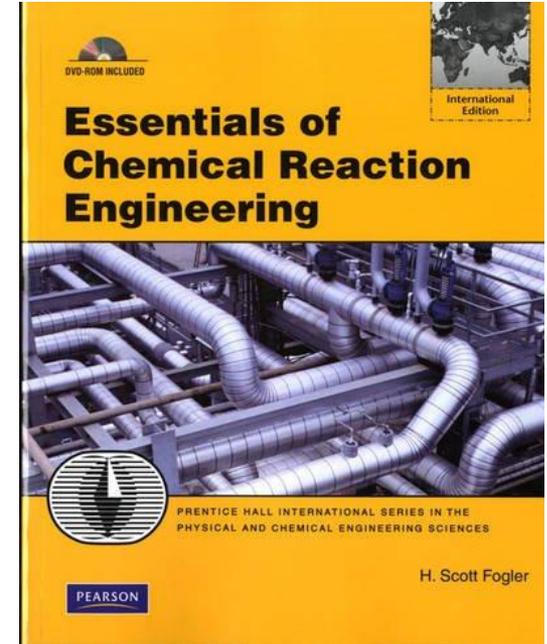


Figure 3

❑ **Scientific journal:** new scientific findings and technical advances are published:

- They are usually electronically published. To get access, the university, company or research centre has to be subscribed.
- “Open-Access” journals: all the publications are freely available for any user. They are funded by the contribution of authors that publish their work.
- English is the preferred language for most fields.

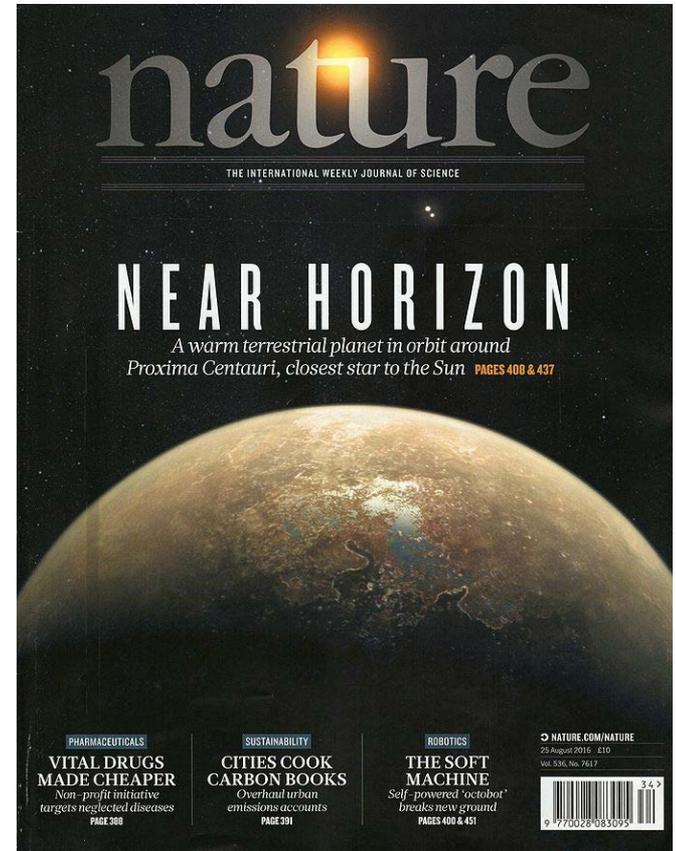


Figure 4

- ❑ **Congresses:** a book of abstracts including the summary of the research works presented in a specific scientific congress.
 - These works are reviewed by experts in the field before their acceptance.
 - They contain preliminary results about a research work. Therefore, the quality of information is not as high as for scientific papers.

- ❑ **Patents:** they provide the owner of the patent to employ, sell or import an invention during a specific period of time.
 - Relevant information regarding technical advances can be obtained from the “description” and “claims” section.
 - They are usually written in a non-friendly style, which makes the understanding difficult.

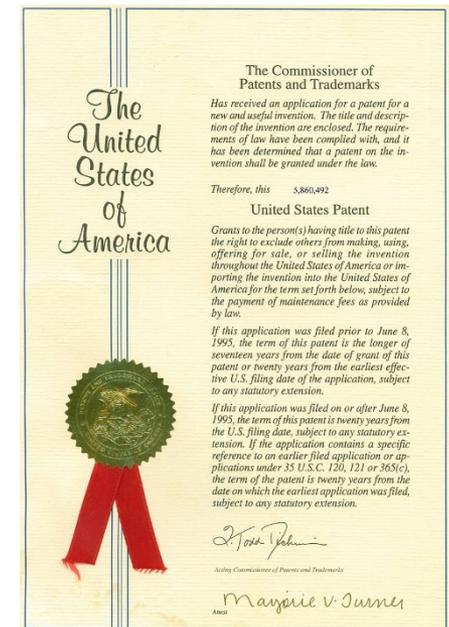


Figure 5

❑ **Web pages and scientific blogs:** they present information about several research/technical topics:

- They are rapidly published, providing an updated source of information.
- Do not have a peer-review process.

2.3.2 Criteria to determine the quality of information

- ❑ Nowadays we have unlimited sources of information which makes the search process complex. One of the main criteria to identify a high-quality bibliographic resource is to have an understanding of the review process that it has undergone.

PEER REVIEW PROCESS

- ❑ A scientific document is evaluated and accepted (or rejected) by two or more expert reviewers. Most commonly, reviewers do not have any contractual link with the scientific journal. This process is common in scientific journals (including “open access”) and books.



Figure 6

❑ **Aims of the peer review process:**

- To detect redundant research (i.e., non original or non relevant).
- To detect poorly planned or badly implemented studies.
- To assure the correct interpretation and communication of the obtained results.
- To provide a feedback to the editor about the quality of the work, thus facilitating the final decision.

❑ In any case, the peer review process is not perfect, so the reader should have the ability to judge the quality of the information:

- Evaluate the claims and the evidences to support them.
- Which is the methodology employed? How did they get the data? Do these data support the claims? Which are the limitations of the study?

- ❑ The relationship between the speed of publication and quality of information is displayed in figure 7. The studies subjected to peer review processes are more reliable in terms of quality. For a professional reader, having **updated** (speed of publication), **high-quality** (quality) and strictly reviewed information is of vital importance.

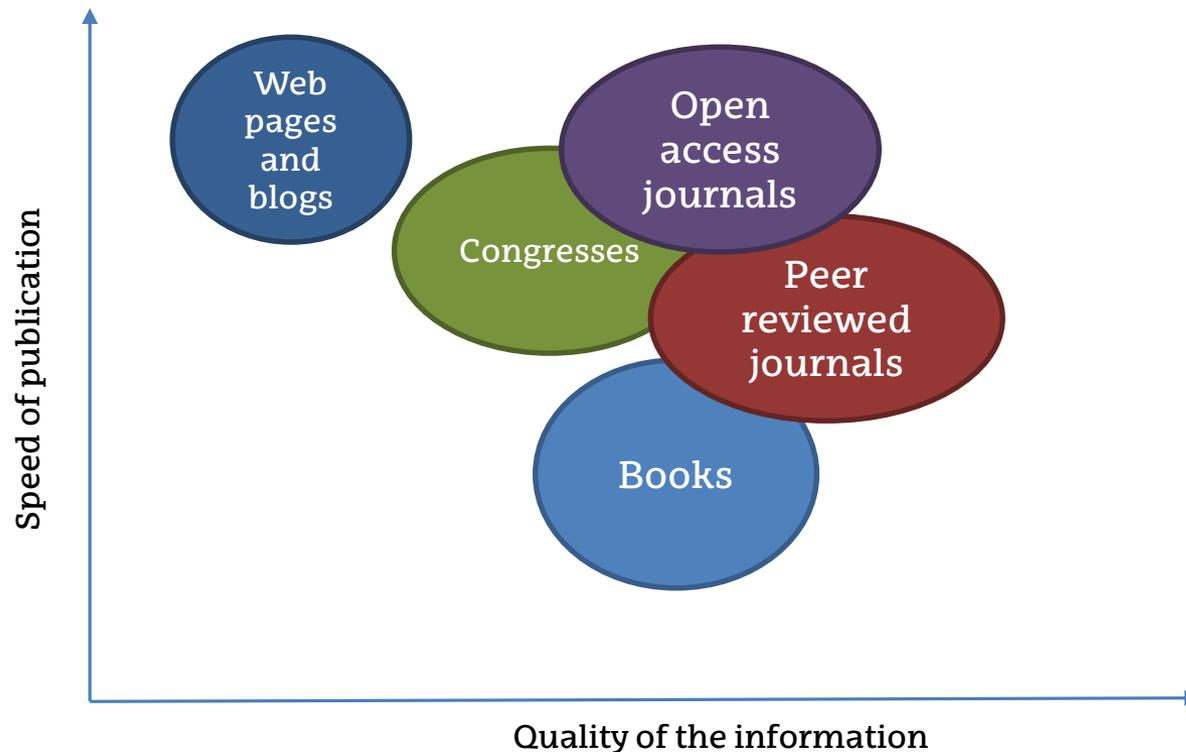


Figure 7

QUALITY CRITERIA IN SCIENTIFIC JOURNALS

- ❑ The number of scientific journals increases annually.
- ❑ In each field of knowledge, journals are classified based on their **impact factor**, which provides information about the number of citations per article for a specific period of time.
- ❑ *Journal Citations Report*, published by Thomson Reuters, provides the impact factor for over 2250 scientific journals.

$$\text{Impact Factor 2017} = \frac{\text{Total number of citations for a scientific journal in 2017 for articles published in 2015 – 2016}}{\text{Number of articles published in a scientific journal in 2015 – 2016}}$$

Ranking	Journal	Impact factor
1	Energy & Environmental Science	30.067
2	Progress in Energy and Combustion Science	25.242
3	Applied Catalysis B.-Environmental	11.698
4	Applied Energy	7.900

The first four journals in Chemical Engineering field (Journal Citation Reports®, 2017).
A video showing the process to find the impact factor is available in the online platform.

CRITERIA TO FIND EXPERTS IN A FIELD

- ❑ Whenever you search for information within a specific topic, you will realize that some authors appear repeatedly and that they have high amount of citations.
- ❑ In the scientific papers, detailed contact information about the corresponding author is provided. This is useful to ask questions about the paper or to find potential collaborations.
- ❑ **ORCID Number** (*Open Researcher and Contributor ID*) <https://orcid.org/>
 - It is an alphanumeric code to precisely identify authors.
 - It automatically updates the scientific contributions of authors.
 - It solves problems related to:
 - Authors having the same name.
 - Cultural differences that affect the order of the name/surname.
 - Presence of special characters.

h index

- ❑ This index, which was developed by Hirsch J.E. from the University of California in San Diego in 2005 [3], is an author-level metric that attempts to measure both the productivity and citation impact of publications of a scientist or scholar.
- ❑ Definition: number of h scientific articles published by an author that have at least h number of citations.
- ❑ Scopus provides a browser to find the h index of several scientists/scholars.

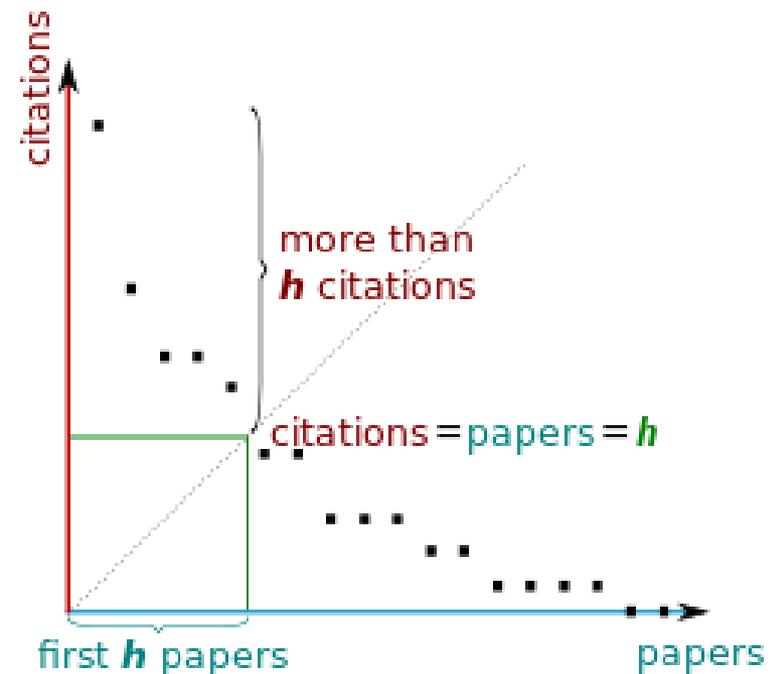


Figure 8

<https://www.scopus.com/search/form.uri?display=authorLookup>

2.4 TOOLS TO SEARCH AND MANAGE INFORMATION

2.4.1 Databases

TESEO

- ❑ It is a browser of PhD theses from the Spanish Ministry of Education.
- ❑ The access is free.



Está usted en: ▶ Portada ▶ Universidades ▶ Educación superior universitaria

Tesis doctorales: TESEO

> Ayuda

Consulta de la Base de datos de Tesis Doctorales (TESEO)

Rellene los campos del siguiente formulario con las palabras o frases que conozca de los documentos que desea localizar.

Búsqueda Avanzada Entrar como usuario registrado Registrarme como Doctorando

Buscar en TESEO

Título:

Autor:

NIF/NIE/Pasaporte:

Universidad: -- Universidades --

Curso académico: Desde: / Hasta: /

Atención a usuarios:

> Correo electrónico: <https://www.educacion.gob.es/teseo/irGestionarConsulta.do>

Figure 9

WEB OF SCIENCE (WOS)

- ❑ It is a powerful resource that belongs to Thomson Reuters.
- ❑ It has online access and it is compulsory to belong to a research organization (university or research center) or to connect via VPN connection.
- ❑ The search can be done by title, keywords, authors, ORCID number, topic, DOI, year of publication, etc.



Figure 10

A video showing the search in Scopus is available in the online platform.

SCOPUS

- ❑ SCOPUS is a bibliographic database containing summaries of scientific articles in the field of science, technology, medicine and social sciences.
- ❑ It belongs to Elsevier and, as for WOS, only researchers/students belonging to universities and/or research institutions have full access.
- ❑ It allows either basic or advanced searches, by title, author, abstract, keywords, DOI, etc.

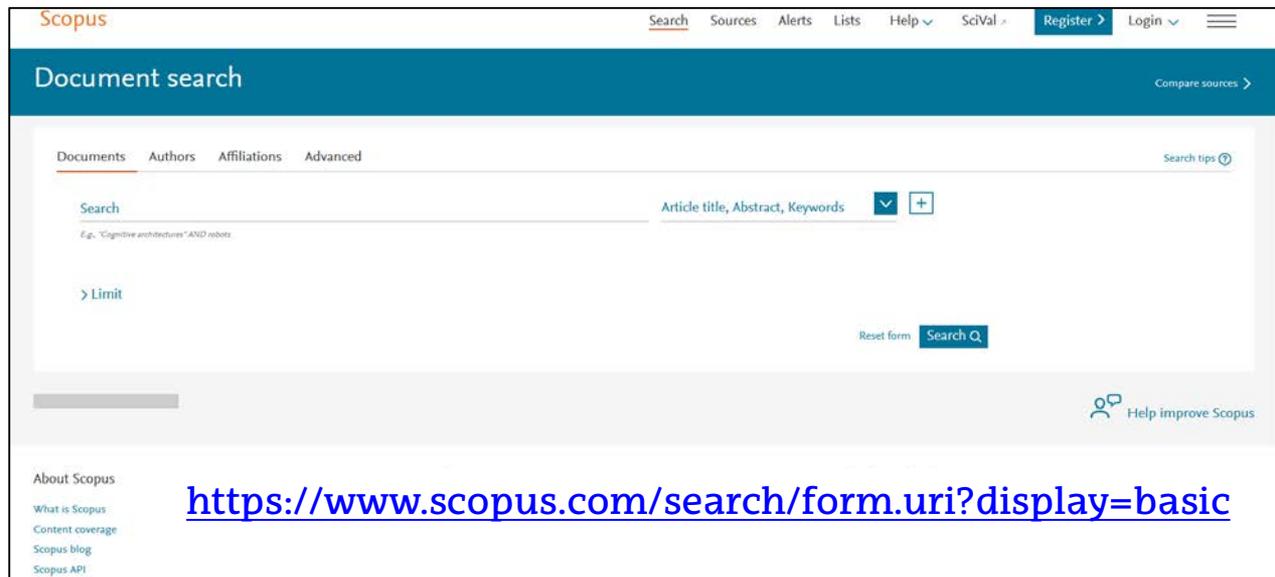


Figura 11

- ❑ Google Scholar is a browser that allows the search of academic documents such as articles, theses, books, patents, abstract of congresses, etc.
- ❑ Access is free.
- ❑ The main difference with respect to Google is that Google Scholar is a specialized browser that classifies the results based on their relevance.
- ❑ It displays the number of citations the articles have received and who has cited them.
- ❑ Negative aspect of Google Scholar:
 - The search systems is too simple (i.e., the results cannot be filtered by type of document, topic, field, etc.)
 - The quality of the content is heterogeneous, from high-quality research to teaching guides or final degree projects → it requires careful examination of the search process.

BROWSERS OF PATENTS

- ❑ PATENTSCOPE allows free access to documents from national and regional patent offices. More than 74 million patents are available within this platform. <https://patentscope.wipo.int/search/es/search.jsf>
- ❑ ESPACENET allows free access to information about inventions and technical developments from the 19th century. More than 100 million of documents are available within this platform. <https://worldwide.espacenet.com/>
- ❑ GOOGLE PATENTS includes more than 87 million patents from 17 patent offices from all over the world. <https://patents.google.com/>
- ❑ INVENES is the database from the Spanish Office of Patents and Trademarks and contains more than 2 million of references. <http://invenes.oepm.es/InvenesWeb/faces/busquedaInternet.jsp;jsessionid=3-qI3PrkyRs0cy8IjM02Xwxm.srvvarsovia1>

2.4.2 Bibliographic managers

- ❑ Databases containing bibliographic references can be made and managed through bibliographic managers. Besides, these bibliographic managers facilitate the development of bibliography and the automatic insertion of citations within a document in several formats.
- ❑ There is a wide range of bibliographic managers. Herein, two examples, particularly useful for authors, are presented: Refworks and Mendeley.

REFWORKS

- ❑ Allows to:
 - Create and manage databases of personal references.
 - Import references from several electronic sources (databases, web pages, RSS, etc.)
 - Insert automatically citations and make bibliographies in Word or any other text processor (those that allow .rtf documents).

- ❑ Bibliographic references and documents are stored in the Refworks server and are available from any computer with internet access.
- ❑ It can be used either from MAC or PC:

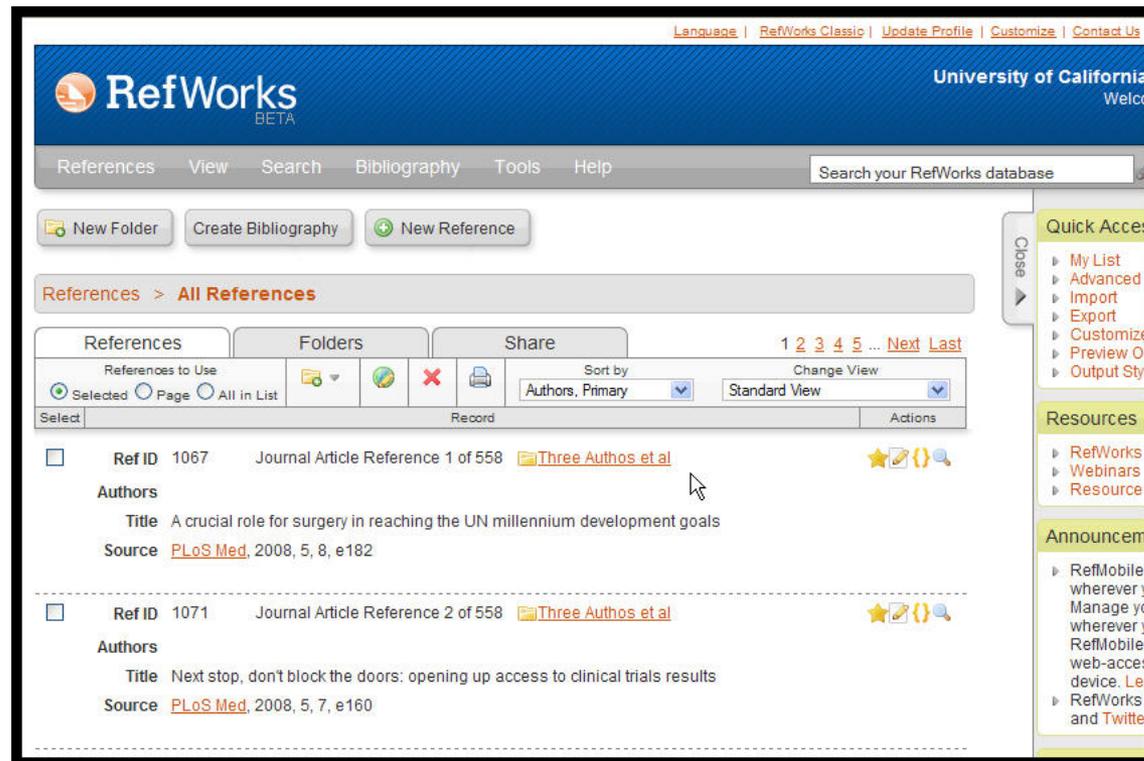


Figure 12

Look at the link to the Refworks 2.0 Manual from the UPV/EHU within the recommended readings.

- ❑ Mendeley is a bibliographic manager that combines a web version with a desktop version.

The screenshot displays the Mendeley Desktop application window. The main area shows a list of documents with columns for Authors, Title, Year, Published In, and Added. A tooltip is visible over the entry for 'Identification of platinum phases on γ -alumina by XPS'.

Authors	Title	Year	Published In	Added
Wang, Tianmao; Liu, Sibao; Tamura, Masazumi; Nakagawa, Yo...	One-pot catalytic selective synthesis of 1, 4-	2018	Green Chemistry	mar 27
Hirsch, J E	An index to quantify an individual's scientific research output	2005	Proceedings of the National Academy ...	mar 14
Watanabe, Kiyoshi; Yamagawa, Noriyuki; Torsawa, Yasuhiro	Re-VIEWS Cyclopentyl Methyl Ether as a New and Alternative Process Solvent Abstract :	2007		mar 4
Zhang, Hongxun; Liu, Guangyu; Li, Chen; Zhang, Lei	Liquid - Liquid Equilibria of Water + Acetic Acid + Cyclopentyl Methyl Ether (CPME) System at Different Temperatures	2012		mar 4
Watanabe, Kiyoshi	The Toxicological Assessment of Cyclopentyl Methyl Ether (CPME) as a Green Solvent	2013		mar 4
Vermaire, D.C.; van Berge, P.C.	The preparation of WO3TiO2 and WO3Al2O3 and characterization by temperature-programmed reduction	1989	Journal of Catalysis	feb 19
Ertl, Gerhard; Knözinger, Helmut; Schüth, Ferry; Weiskamp, Jens	Handbook of Heterogeneous Catalysis	2008		feb 19
Alkhtar, Farid; Andersson, Linnéa; Ogunwumi, Steven; Hedri, Niklas...	Feature Article Structuring adsorbents and catalysts by processing of porous powders	2014	Journal of the European Ceramic ...	feb 14
Kwak, Ja Hun; Hu, Jianzhi; Mei, Donghai; Yi, Cheol-Woo; Kim, Do ...	Coordinationally Unsaturated Al3+ Centers as Binding Sites for Active Catalyst Phases of Platinum on γ -Al2O3	2009	Science	feb 6
Barton, David G.; Shten, Max; Wilson, Ryan D.; Soled, Stuart L.; ...	Structure and Electronic Properties of Solid Acids Based on Tungsten Oxide Nanostructures	1999	The Journal of Physical Chemistry B	feb 6
Pope, M T	Heteropoly and Isopoly Oxometalates	1983		feb 4
Abdelrahman, Omar Ali; Luo, Helen Y.; Heyden, Andreas; Román-Les...	Toward rational design of stable, supported metal catalysts for aqueous-phase processing: Insights from the hydrogenation of levulinic acid	2015	Journal of Catalysis	feb 4
Kong, Xianglin; Wu, Shuxiang; Jin, Yuzhou; Liu, Liying; Liu, Junhua	Continuous Hydrogenation of Ethyl Levulinate to γ -valerolactone over Cu-Zn/ZrO2 Catalyst with Alumina Binder	2017	Energy and Fuels	feb 4
Putrakumar, Balla; Nagaraju, Nelskaly; Kumar, Vanama Pavani; ...	Hydrogenation of levulinic acid to γ -valerolactone over copper catalysts supported on γ -Al2O3-ZrO2/Al2O3- γ -Al2O3	2015	Catalysis Today	feb 4
Casali, J.	Evaluation of the Effects and Consequences of Major Accidents in Industrial Plants: Second Edition	2017	Journal of Molecular Catalysis A: Chemical	feb 4
Hao, Xi; Quach, L.; Korah, J.; Speiker, W. A.; Regalbuto, John R.	The control of platinum impregnation by PZC alteration of oxides and carbon	2004	Journal of Molecular Catalysis A: Chemical	feb 4
Shyu, J Z; Otto, K	Identification of platinum phases on γ -alumina by XPS	1988	Applied Surface Science	feb 4
Brunelle, J P	Preparation of Catalysts by Adsorption of Metal Complex Oxides	1979	Pure Appl. Chem.	feb 1
Kohler, S. D.; Ekerdt, J. G.; Kim, D. S.; Wachs, I. E.	Relationship between structure and point of zero surface charge of molybdenum and tungsten oxides supported on alumina	1992	Catalysis Letters	ene 31
Kitano, Tomoyuki; Hayashi, Tomohiro; Uesaka, Toshio; Shihid...	Effect of high-temperature calcination on the generation of Brønsted acid sites on WO3/Al2O3	2014	ChemCatChem	ene 31
Cope, Christoph; Estes, Deven P; Larmer, Kim; Searles, Keith	Isolated Surface Hydrides: Formation, Structure, and Reactivity	2016		ene 29
Kuba, Stefan; Heydorn, Patricia Concepción; Grasselli, Robert K; G...	Redox properties of tungstated zirconia catalysts: Relevance to the activation of n-alkanes	2001	Phys. Chem. Chem. Phys.	ene 29
Kopetzki, Daniel; Antonietti, Markus	Transfer hydrogenation of levulinic acid under hydrothermal conditions catalyzed by sulfate as a temperature-switchable base	2010	Green Chemistry	19/12/18
Gandarias, Inaki; Medzaki, Peter J.; Nowicka, Ewa; Douthwaite, Mark; ...	Selective oxidation of n-butanol using gold-palladium supported nanoparticles under base-free conditions	2015	ChemSusChem	10/12/18

The right-hand pane shows the details of the selected article:

- Type: Journal Article
- Title: Toward rational design of stable, supported metal catalysts for aqueous-phase processing: Insights from the hydrogenation of levulinic acid
- Authors: O. Abdelrahman, H. Luo, A. Heyden et al.
- Journal: Journal of Catalysis
- Year: 2015
- Volume: 329
- Issue: 10-21
- Pages: 10-21
- Abstract: Aqueous-phase hydrogenation of levulinic acid (4-oxopentanoic acid) and 2-pentanone was considered to probe the activity and stability of supported Ru catalysts during ketone hydrogenation in water. Selected supports include activated carbon, amorphous SiO2, γ -Al2O3, and TiO2. For both probe molecules, intrinsic hydrogenation activity was independent of support identity and Ru particle size. Moreover, the presence of a secondary functional group in levulinic acid (i.e., a carboxyl group) and the resulting dissociated protons do not appear to perturb the activity of Ru sites in water. LA hydrogenation thus appears kinetically equivalent to that of 2-pentanone, and both occur with an average turnover frequency of 0.11 s⁻¹ under our experimental conditions (323 K, 24 bar H2, 0.5 M LA/2-Pentanone). Supported Ru clusters were susceptible to both irreversible and reversible modes of deactivation. The former was attributed to particle sintering, which is accelerated in bulk water relative to gas phases. The extent of particle growth is relatively insensitive to solution pH and depends primarily on the nature of the s...
- Tags:
- Author Keywords: Aqueous-phase stability; Ketone hydrogenation; Levulinic acid; Ruthenium; Sintering; Sup...
- Publisher: Elsevier Inc.
- URL: <http://dx.doi.org/10.1016/j.jcat.2015.04.026>
- Catalog IDs: ArXiv ID: DOI: 10.1016/j.jcat.2015.04.026 ISBN: 0021-9517 ISSN: 10902694 PMID:
- Files:

Figure 13

- ❑ It allows to:
 - Create your own digital library: it captures, organizes, completes and shares all your references automatically simply by inserting the DOI, PMID or ArXiv ID and finding the references to add the missing information.
 - Group documents of different resources.
 - Create files of shared references with colleagues that work in the same project.
 - Know the trend of the investigation (it suggests bibliography based on your previous searches).
 - Insert bibliographic citations and make bibliographies automatically in Word.

- ❑ There are plenty of user guides created by the libraries of Spanish universities.

REFERENCES

- [1] United Nations Library at Geneva: an International Relations Research Centre. (1976) *International Library Review*, 8, 119-126.
- [2] Latorre A., del Rincón D., Arnal J. (2003). *Bases metodológicas de la investigación educativa*. 1ª ed. Barcelona: Ediciones Experiencia; 2003.
- [3] Hirsch J.E. *An index to quantify an individual's scientific research output*. *Proceedings of the National Academy of Sciences* 46 (2005) 16569-16574.

- ❑ Orna E y Stevens G. *Cómo usar la información en trabajos de investigación*. 1ª ed. Barcelona: Gedisa; 2000.

FIGURE AUTHORSHIP

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