Structure the research project

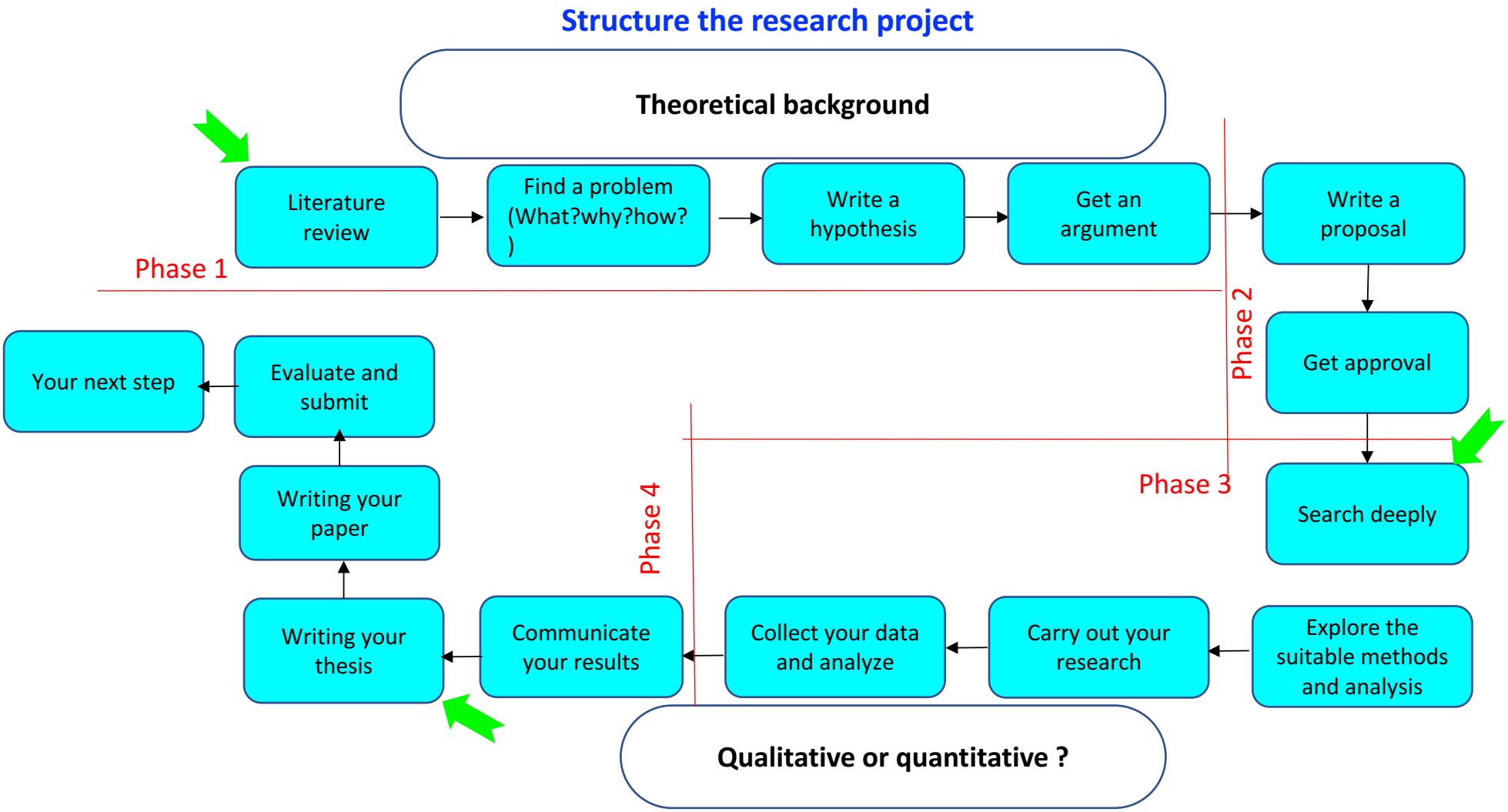
PhD 2022-2023

Chemistry Dep.

Course designer: Dr. Zahraa Salim Mohsin
and Dr. Layla B. Aloom (educational consultant-California-Los Angeles)

CONTENT

- the structure of the research project,
- the research problem,
- Search the literature,
- the research hypothesis,
- the research argument (statement).



Scheme 1. The structure of a typical research project

Structure the research project

Literature review

1- choose the right topic for achievement and publication

* Make sure that the research meets the requirements of scientific research in your field: Read a lot about the relevant topics, and ask the supervisor for the research or colleagues involved.

* Choose the topic that interests you: It may seem obvious, but it really makes the search steps enjoyable and more attractive to accomplish, and makes you challenging.

* Look at the scope of the topic: If the scope of the topic is too broad it may be difficult to find the relevant information,
If the scope of the topic is too narrow to find any information, then you need to refine, see Fig 2

Structure the research project

Literature review

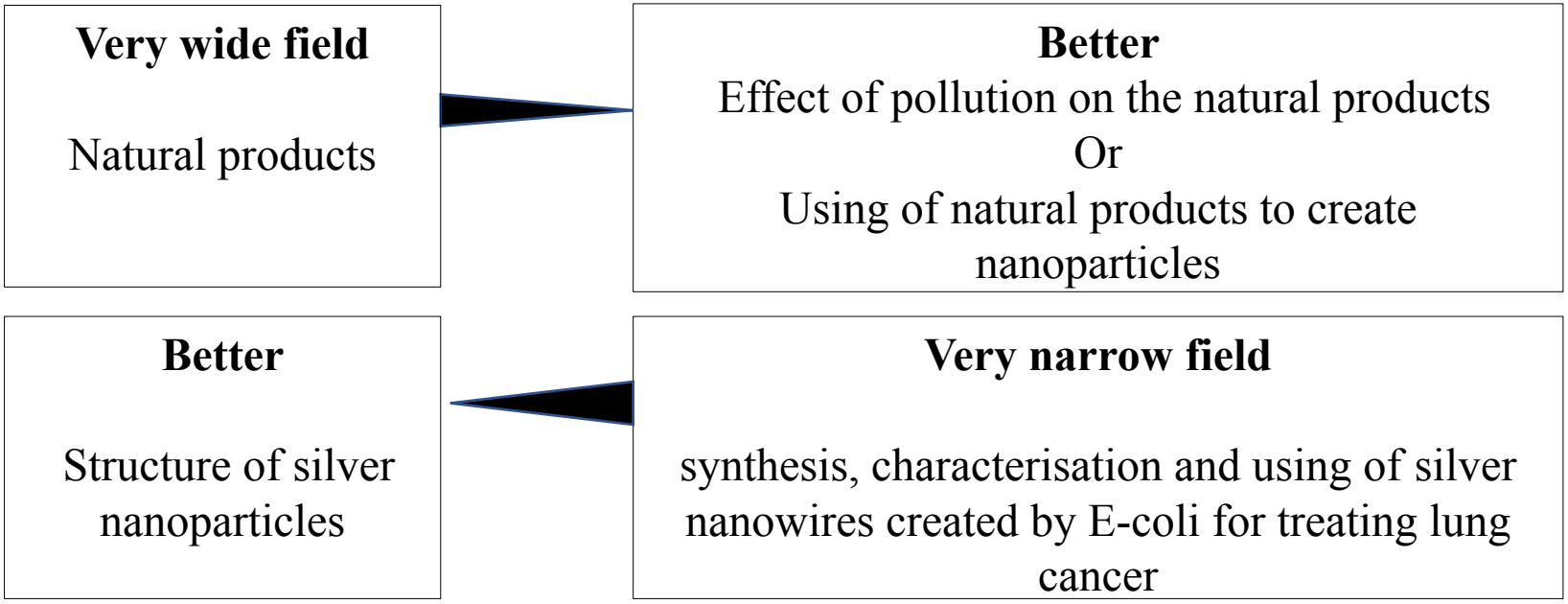


Figure 2. How to control the field of searching the problem

Where to find information

- Libraries

- The university or college library : this should be the first choice, where a huge amount of information and also about all the other information sources listed below.

What you will find in the library?

- Journals and newspapers. These are often catalogued and stored separately to the books and may be available online. As they appear regularly, they tend to be very up to date.
- Electronic databases. These are computer-based lists of publications, on CD-ROM or on the university Intranet or the Internet.

- People and supervisor

There are experts in every field. Some will be willing to advise you, such as members of your own university staff, many of whom will be involved in research. Your supervisor is already in the field and should be able to provide you with his publications or other related.

- The internet

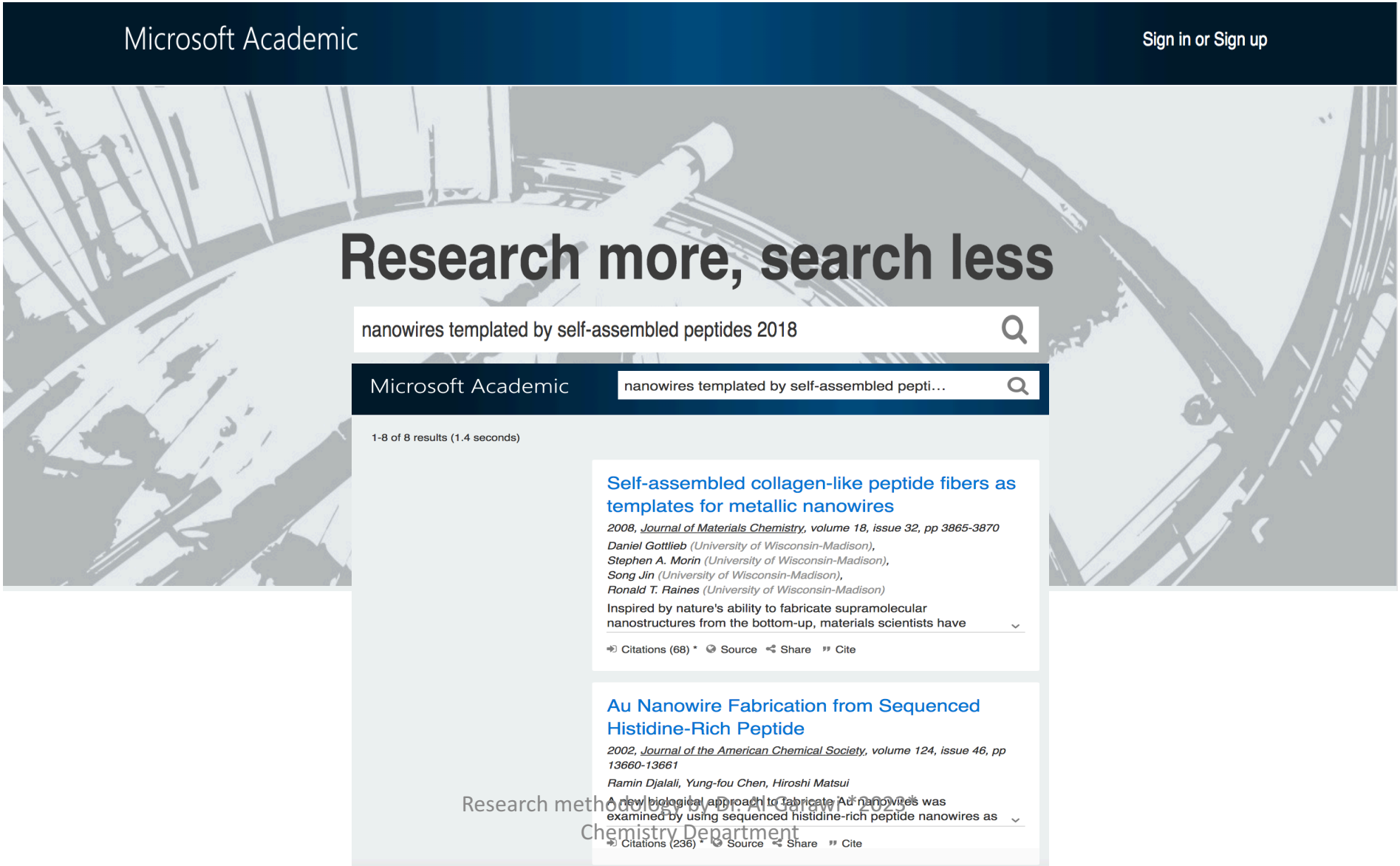
The full gamut of the World Wide Web (www). With thousands of page being added every day, the (WWW) is the biggest single source of information in the world. However, the content is of extremely variable quality, and the biggest challenge when using it is to track down good quality material.

Not all information on the WWW is free. Some are specifically aimed at students and list useful search engines, sites and databases.

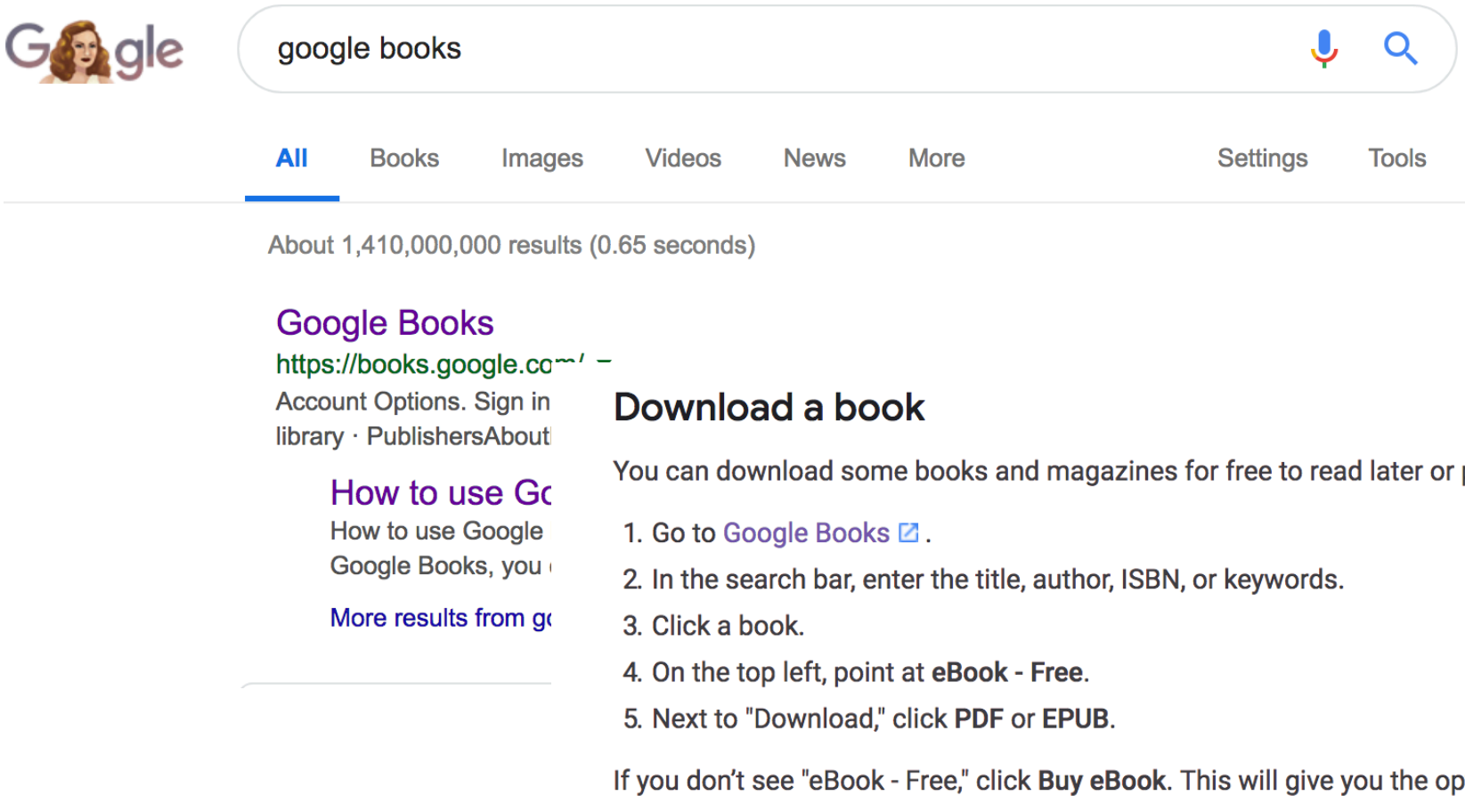
Tools and search engines

* PubMed
* Medline Plus
* National Criminal Justice Reference Services
* OAIster
* Refseek
* DOAJ
* PubChem
* Google
* Google Scholar
* Microsoft Academic Search
* Google Books
* JSTOR
* Bing
* Sweet Search

Tools and search engines

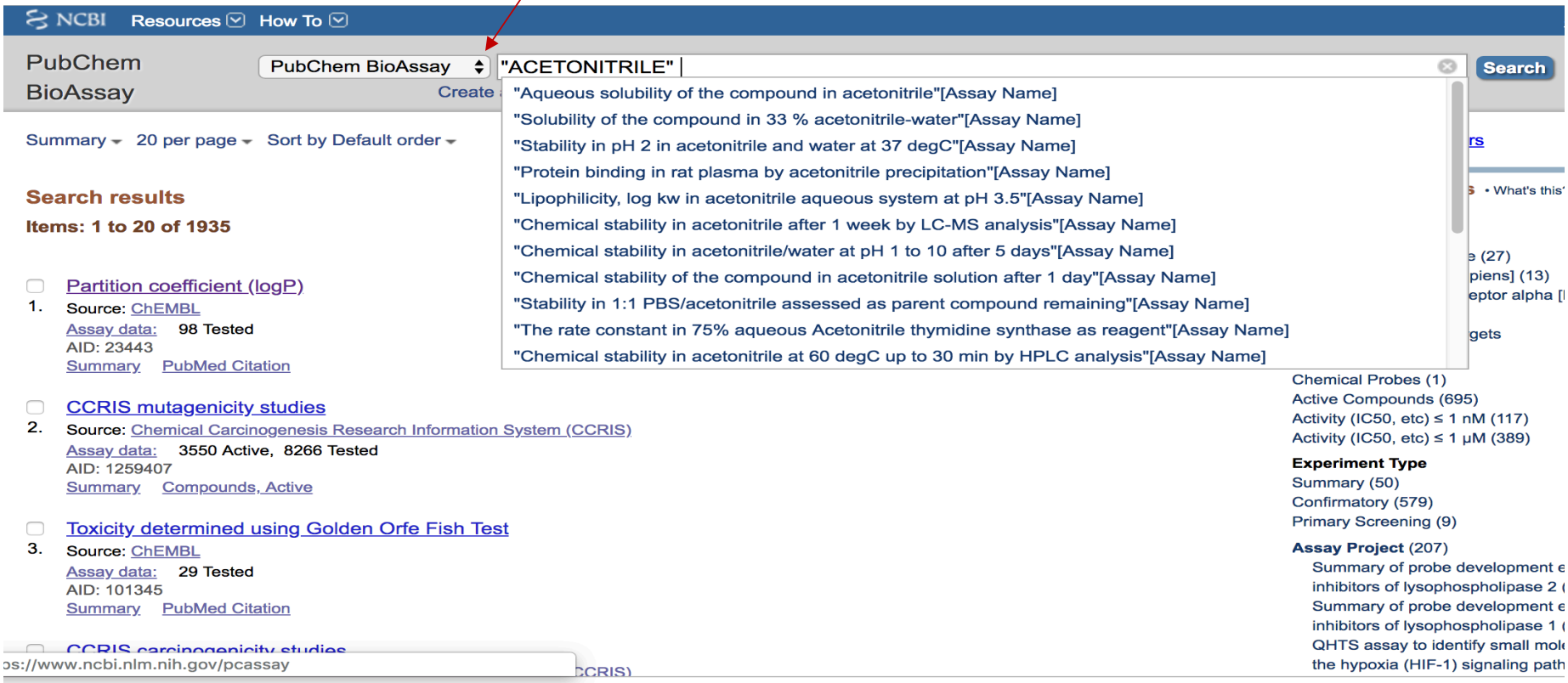


Tools and search engines

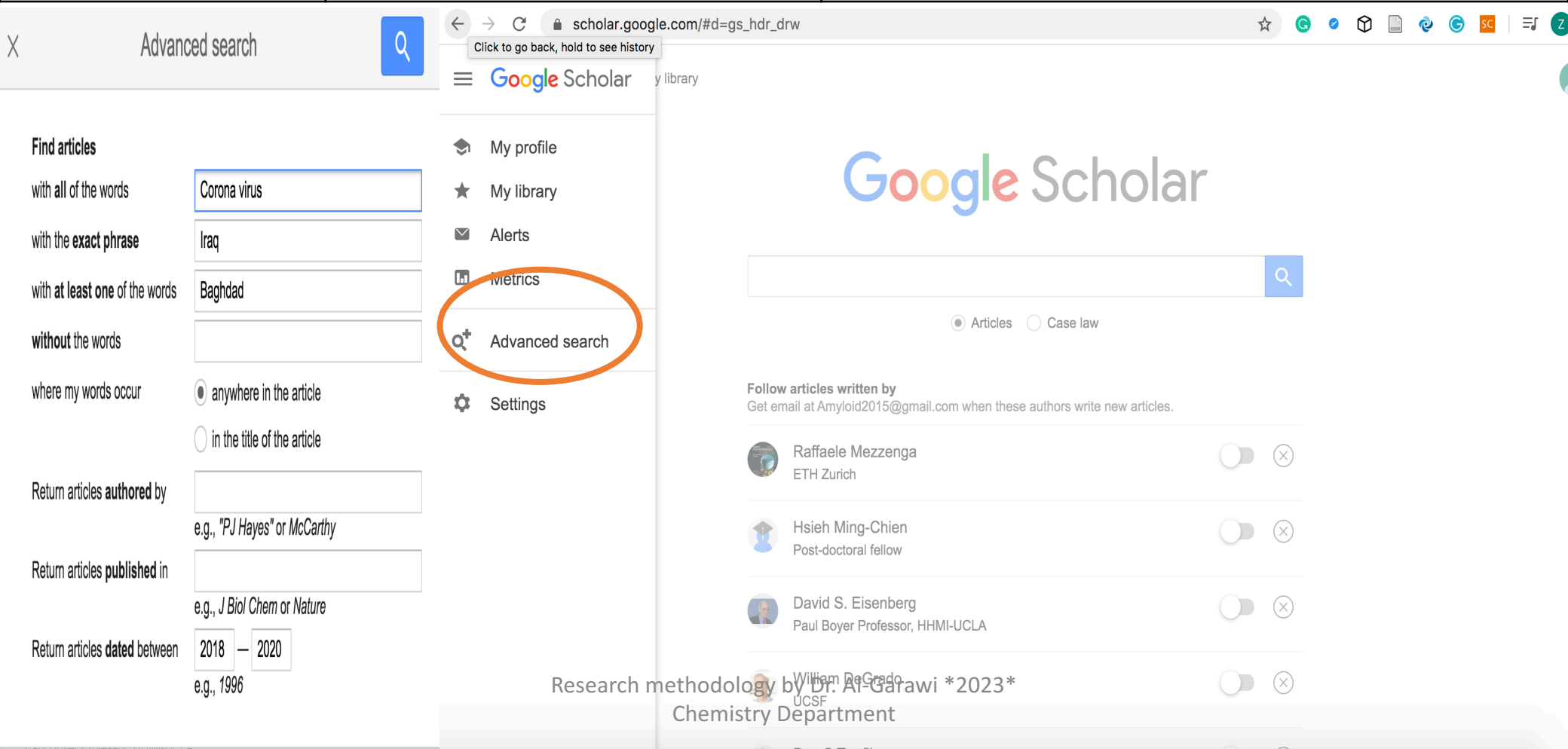


Tools and search engines

Tools and search engines



[Google scholar](#) General (Multidisciplinary)	- is an integrated full-text database for journals, books, protocols, e-References, and books, - free access to search, tables of content, and abstracts, - not limited to, Firefox, Internet Explorer 8, Google Chrome & Safari.	- offers 2,436 fully peer-reviewed journals and 40,153 books online. - searches for scientific articles in certain subject fields.



Databases	Description	Coverage
(Web of Science) Web of Science General (Multidisciplinary) https://clarivate.com/webofsciencegroup/solutions/web-of-science/	- Very High impact researches, - a unique search method, - search by topic, author, Date, and the title using: the General Search and Advanced Search options.	- Science citation index (1945-present). WOS indexes 6.650 major journals across 150 scientific disciplines. - Social sciences citation index (1956-present). WOS indexes 90 million records across 55 social sciences disciplines. - Arts and humanities citation index (1975-present). WOS fully covers 1,160 of the world's leading arts and humanities journals. - Conference & conference proceedings citation index, social science & humanities (1991-present). - KCI-Korean Journal database (1980-present)

Databases	Description	Coverage
Scopus General (Multidisciplinary) https://www.scopus.com/home.uri	- a large database for abstract and citation - quality web sources, - smart tools to track, - Find out how many citations of articles. - Analyze citations for a particular journal issue, volume or year, - to quickly check the main journals, disciplines and authors in your area,.	- 20,000 peer-reviewed journals (> 2,600 Open Access journals) - 390 trade publications. - 370 book series. - 5.5 million conference papers. - 29 million records include references going back to 1995 (84% include references). - 21 million pre-1996 records go back as far as 1823
ScienceDirect Science (Multidisciplinary) https://www.sciencedirect.com/	- Open access , and non access papers. - search by Date, the title, author information (can refine the search to narrow your results). - read abstract for fast selection	- Science, health and medical researches - Earth & Planetary Sciences - Agricultural and Biological Sciences - Environmental Science SD access to more than 30,000 e-books; 2,500 journals; and more than 13 million full-text articles.

Databases	Description	Coverage
Springer Link Science (Multidisciplinary) https://rd.springer.com/	- is an integrated full-text database for journals, books, protocols, e-References, and books, - free access to search, tables of content, and abstracts.	- offers 2,436 fully peer-reviewed journals and 40,153 books online. - searches for scientific articles in certain subject fields.

Databases	Description	Coverage
PubMed Medicine PubChem Chemistry	- developed by the National Library of Medicine (NLM),. - provides free access to MEDLINE, a database of more than 11 million bibliographic citations and abstracts from nearly PubMed. - PubMed includes "Old Medline." Old Medline covers 1950-1965. (Updated daily)	- 4,500 journals in the fields of medicine (nursing, dentistry, veterinary medicine, pharmacy, allied health, health care systems, and pre-clinical science) . - access and links to the Biotechnology Information (NCBI). (molecular biology databases) - These databases contain DNA and protein sequences, 3-D protein structure data, population study data sets, and assemblies of complete genomes in an integrated system.

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Current Opinion in Structural Biology, Volume 58, October 2019, Pages 34-42

Anthony WP Fitzpatrick, Helen R Saibil

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Screening for Transthyretin Amyloid Cardiomyopathy in Everyday Practice

JACC: Heart Failure, Volume 7, Issue 8, August 2019, Pages 709-716

Ronald M. Witteles, Sabahat Bokhari, Thibaud Damy, Perry M. Elliott, ... Pablo Garcia-Pavia

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Hyperpolarized MAS NMR of unfolded and misfolded proteins

Solid State Nuclear Magnetic Resonance, Volume 98, April 2019, Pages 1-11

Anna König, Daniel Schölzel, Boran Uluca, Thibault Viennet, ... Henrike Heise

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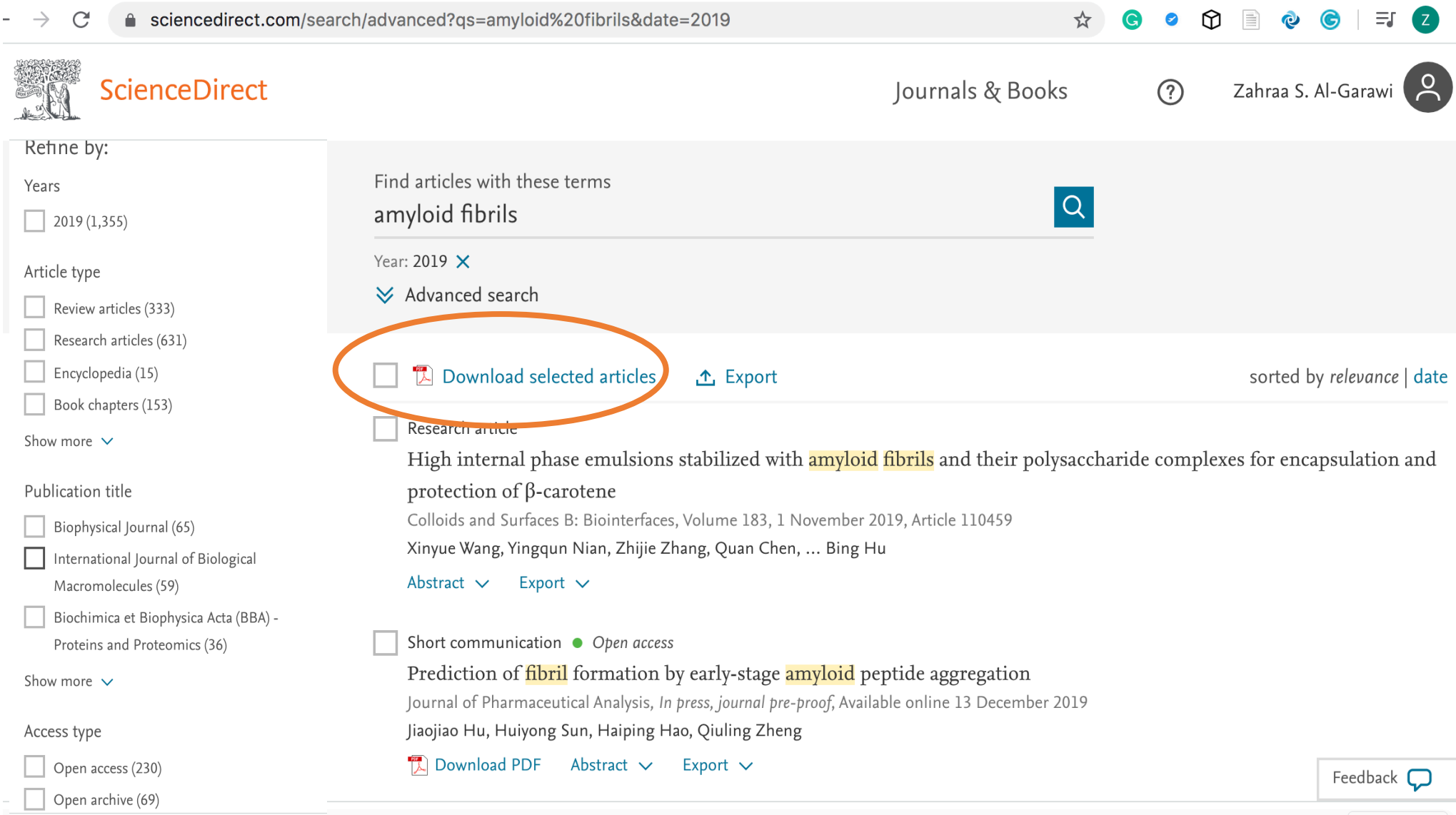
Best Practices for Prognostic Evaluation of a Patient With Transthyretin Amyloid Cardiomyopathy

JACC: CardioOncology, Volume 1, Issue 2, December 2019, Pages 273-279

Kent Y. Feng, Rahul S. Loungani, Vishal N. Rao, Chetan B. Patel, Adam D. DeVore

Feedback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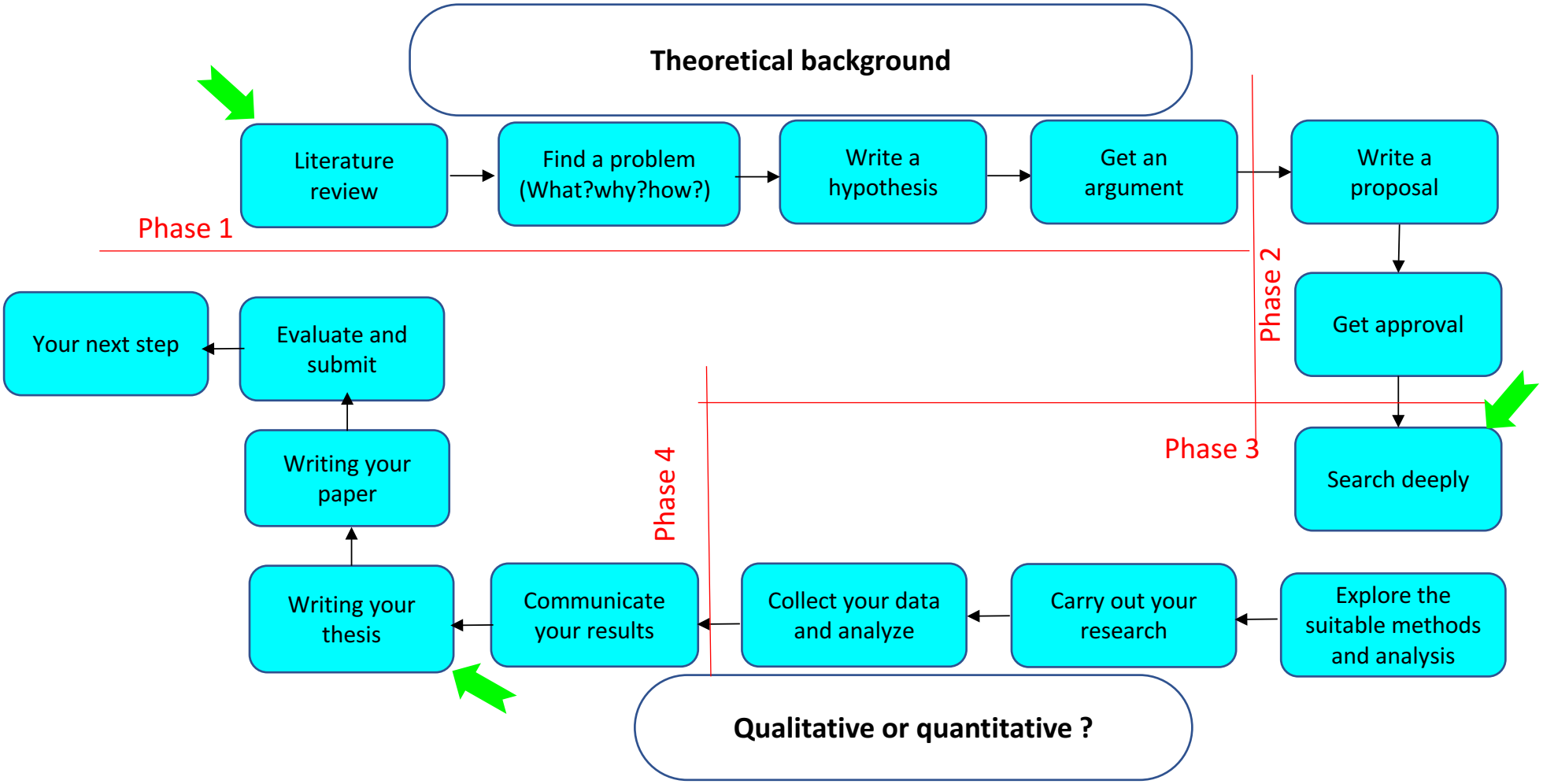


Scheme 1. The structure of a typical research project

Structure the research project

How to Find a problem (What? why? how?)

A **research problem** is a specific issue or gap in existing knowledge that you aim to address in your research. To provide a reason for doing your research, it is necessary to first identify some problems or questions in your research that need to be answered.

Why is the research problem important?

Without a well-defined research problem, you are likely to end up with an unfocused and unmanageable project. The problem will generate the subject, the aims and the objectives of the research.

The problem will indicate what sort of data need to be collected and what kind of analysis is suitable to come to logic conclusions that answer the questions raised for your problem.

The research problem is the heart of a study. It is a clear, definite statement of the area of concern or investigation and is backed by evidence

Structure the research project

How to Find a problem (What? why? how?)

The problem must be:

1- significant, i.e. not a repeat of a previous work,

2- specific, in order to limit its scope to a practical investigation.

3- possible to obtain the information required to explore the problem,

Examples:

- Medical applications of Schiff base and imidazole compounds.
- autism and deficiency of vit D.

Then, examine the different aspects of the problem area to be particularly interest to you.
Then a problem can be defined by formulating a hypothesis.

How to Find a problem (What? why? how?)

Example 1

A main problem (question): Could vaccines have an effect on lung tumor?

Breakdown the main problem into multiple questions to be able to answer the main question:

1- What factors affect lung tumor?

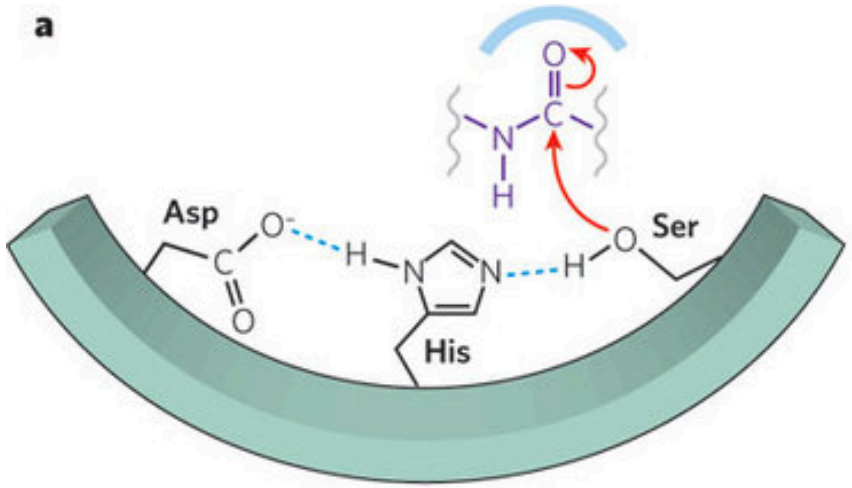
2- How many vaccines have an effect on lungs?

3- Why vaccines could affect the lung ?

4- Is there any project studied this effect before?

Structure the research project

How to Find a problem (What? why? how?)



Example 2

A main question: can we synthesize artificial protease ?

1- What type of reaction protease catalyze? where it acts in our body?
2- What the active center of the enzyme contains ? Explore the amino acids that are located on the active center

3- How protease works? Study the mechanism of the reaction

4- Can we make a design? Select the amino acids that create the active center and try to make a design and compare it with a control design

The hypothesis

What is a hypothesis and null hypothesis?

1. A hypothesis is a suggested solution on questions about the subject or the topic you need to search about, based on the literature review and your understanding of information.

2. The null hypothesis is always deny the hypothesis (the opposite hypothesis).

Hypotheses are nothing unusual. If something happens in our everyday life, we tend to suggest a reason for its occurrence by making rational guesses. These reasonable guesses can be expressed in the form of statement **(Hypothesis)** .

How is hypothesis useful in your research?

- It is the starting point for investigation.
- It is the key point for deep research
- It is useful to know what type of study (qualit. Or quanti.).
- It is useful to set your experiments to have the valid outcomes that would confirm or deny the proposed hypothesis

Examples

Research question (problem)	Hypothesis	Null hypothesis
Can silver nanoparticle be used as as a biosensor?	If a biological molecule attached to Ag-nanoparticles, it could act as a biosensor	Ag-nanoparticles are not suitable to create a biosensor
What are advantages of using Cyro-TEM on the resolution of images?	If Cyro_TEM attached to 2 bar N_2 pressure, then high contract between the electron beam and the tested molecules	There is no specific advantage of using Cyro-TEM over TEM.
How effective is silica to create nanoparticles ?	.If a sol-gel reaction performed by silica precursor $Si(OH)_2$, then different sizes of silica nanoparticles may form	Silica has no effect on creating nanoparticles.
What are the health benefits of eating an apple?	If the apple is eating everyday, it will increase the antioxidant vit C level in the body and increase the immunity	Increasing apple consumption will result in decreasing frequency of flue

Step 1: **FIND A TOPIC**

Step 2: **Create problems and hypothesis**

Problems	Hypotheses
1. Why Obesity is caused by lack of exercising the body?	1. lack of exercising the body may cause accumulation of fat in the body.
2. Why Men exercise more than women.?	2. Men feel stronger when their muscles are strong.
3. Why Eating junk foods without exercising may cause obesity.?	3. Eating junk foods Without burning the fat by exercise causing fat to build up in the body.

Step 3 **Design an experiment**

Experiment on the hypothesis you drew earlier (qualitative design) Such as: Reading magazines and newspapers, questionnaire**,** Interviewing people**,** Observation of people's behavior**,** Telephone calls**,** Emails

Step 4 **Collecting data :** The data collected should be analyzed and conclude.

Step 5 **Communicate the conclusion:** The results on the findings and conclusion should be presented and communicated to the supervisors to finally decide the most suitable hypothesis.

Step 6 **Remember The null hypothesis**

"Men and women are equally likely to have obesity"

Where to include the hypothesis in the article/ thesis /dissertation?

In the Abstract:
1- A little background
2- the gab in the literature you want to fill
3- your hypothesis of doing the research

In the last paragraph of introduction:
1- show briefly what is missing in the literature
2- include your hypothesis of your research to fill that missing part.

What is the difference between the aim and the hypothesis?

- An objective is an intent while a hypothesis is what the researcher believes.
- A researcher may have multiple hypotheses to achieve an objective.
- Hypothesis should come after objectives. In other words, a researcher would aim to achieve the objectives through the hypotheses.

Get an argument (thesis statement)

- **What is the argument?**
- The term argument refers to "*a reasoned attempt to convince the reader to accept a particular point of view about a debatable topic*", in much the same way that a lawyer argues a case in a court of law.

- The argument should correlate between your question and your hypothesis to answer this question and your evidences to prove this hypothesis which at the end gives you a logical reason to argue.

- One should not debate the fact that ***Fe is one of the transition metal ion*** or the fact that the ***light is faster that sound***,
- but one can debate whether or not do a regular sport relate to the sugar and fat levels in men.

- **Why argument is useful?**

- Prove the hypothesis of the project,
- convince the reader how you logically approved the hypothesis of the project.

Get an argument (thesis statement)

How to write the argument?

Use one of these phrases to write the argument:

- This suggest
- This shows/reveals/describes/demonstrates/ illustrates
- This make clear
- This proves
- Since that

- **Where to include the argument (thesis statement) in the thesis of research paper?**

A good, standard place for your thesis statement is at the end of the introduction.

Examples

Research question	Hypothesis	Argument
Can Au-nanoparticle be used as a biosensor?	If a biological molecule attached to Au-nanoparticles, it could act as a biosensor	Au-nanoparticles are abled to act as biosensor of hemoglobin with high sensitivity, good reproducibility and stability.
What are advantages of using Cyro-TEM on the resolution of images?	If Cyro-TEM attached to 2 bar N_2 pressure, then high contract between the electron beam and the tested molecules	The major advantages of Cryo-EM's are saving time and work and high resolution images. It looks at the molecule a near-native state with X-ray crystallography.
How effective is silica to create nanoparticles ?	.If a sol-gel reaction performed by silica precursor $Si(OH)_2$, then different sizes of silica nanoparticles may form	Using precursors of silica is highly effective to create nanowires, nanotubes and nanospheres
What are the health benefits of eating an apple?	If the apple is eating everyday, it will increase the antioxidant vit C level in the body and increase the immunity	Increasing apple consumption will result in decreasing frequency of flue

Example " the research process"

Example:

The problem: is the percentage of obese women larger than that of men?

1- Question ?

1. Does lack of exercising cause the body?
2. Does Men exercise more than women?
3. Does Eating junk foods without exercising cause obesity.?

2- Hypothesis

1. **lack of exercising causes accumulation of fat in the body.**
2. **junk foods Without burning the fat causes fat to build up in the body.**

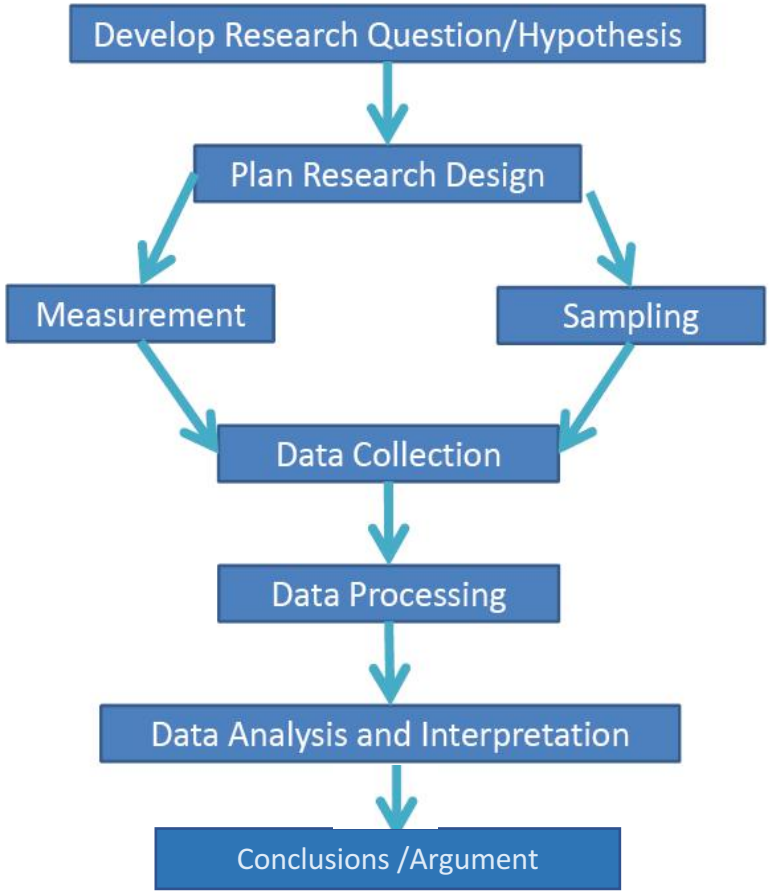
3- Experiments

1. Determine your sample (number of male and female + age + job)
2. Measure the value of lipids in both sexes
3. Questioner form about playing sport
4. Interview with target sample = eating junk food?

4-results and discussion

A sample of 50 males and 50 female aged 40-50 y worked in the chemistry department were involved in this study. Results indicated that *Lipid level in males was significantly lower than than in female. Males playing boxing had lower lipid values than those doing a regular walk. Males playing boxing had lipid values lower than females who are not enrolled in any type of sport. Females ate junk foods a lot.* **This suggests that Women are more likely to have obesity than men (your argument).**

The research process



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