سيانة أساسيات البحث العلمي

مصتز عطا الله د. النشر العلمي ـ فنيات الحتابة: الأسلوب

السبت 8 مارس، الساعة 7:00 مساءا، بتوقيت القاهرة.





Presentation Outline

- Literature review.
- Structuring a paper
- Writing tips.



PaperTypes

A. Theoretical papers:

•These are devoted to the development of a new computational technique or the establishment/proof of a new mathematical theory. They require clear definition of the problem and solid analytical derivations before showing the results. The conditions at which the theory is valid must be clearly specified, so that the reader knows when this theory can be used. Same holds for clearly stating at which conditions the theory is not valid.

•Computational paper types: include the algorithm/application examples/proofs of convergence.

•Analytical paper types: include more equations and may give an abstract result with no applications



PaperTyps

B. Experimental papers

 These do not require much analytical expressions. Clear and solid measurement results are the key for the acceptance of such papers. It is crucial to clearly explain the measurement setup and the conditions at which the measurements were made.



PaperTypes

C. Fabricational papers

•These papers outline the steps involved in manufacturing/assembly or construction of a device or a structural system. There could be a section of fabrication methods in experimental papers as well. They may include case studies as well.

D. Clinical papers

•Limited to the field of medicine. They usually include studies on the medical history of a group of patients over a period of time. Several statistical methods are involved. Statistical tools and models should be adequately described. Hypothesis testing and implications have to be discussed.



Literature Review (Not!)





Structure of a Paper

- Abstract
- Introduction & Literature Review
- Experimental Method/Mathematical model
- Results
- Discussion
- Conclusions
- References



Definition of a Literature Review

- A <u>concise</u>, <u>effective</u>, and <u>critical</u> assessment of several studies on a specific research topic.
- A critique of <u>previous research</u> and the <u>current state-of-knowledge</u>, clarifying the <u>outstanding scientific</u> <u>issues</u> (gaps) in a certain research area.
- An objective analysis of <u>scientific arguments</u>, identifying the <u>similarities and differences</u>, <u>consistencies and inconsistencies</u>, and <u>controversies</u>.
- A <u>timeline review</u> of the <u>development</u> of a certain technique, method, or process, or of the theoretical <u>understanding of a certain phenomenon</u>.



Purpose of a Literature Review

- Identifying <u>methodologies and techniques</u> that have been used;
- Discovering important variables relevant to the topic;
- Synthesising and gaining a new perspective;
- Identifying <u>relationships</u> between ideas and practice;
- Establishing the context of the topic or problem;
- Rationalising the significance of the problem;
- Enhancing and acquiring the subject vocabulary;
- Understanding the structure of the subject;
- Relating ideas and theory to applications;
- Placing the research in <u>a historical context</u> to show familiarity with state-of-the-art developments;
- Distinguishing <u>what has been done</u> from <u>what needs to</u> <u>be done</u>.

C Hart (1998) Doing a literature review. London:Sage



General Issues about Writing Literature Reviews

- Level: Written for someone at your level (PhD researcher) and higher.
- **Sources:** Peer-reviewed (quality-controlled) highimpact publications, patents, and edited books.
- **Style:** Scientific third-person passive voice.
- **Referencing:** Use EndNote to arrange the sources.
- **Plagiarism:** Cite, quote, or paraphrase, but never copy.
- **Planning:** Plan an outline before you write. Sort, prioritise, evaluate, and decide on the sources.



How to Start

- Literature search: identifying the high impact peerreviewed publications, from highly cited researchers.
- **Sorting:** prioritising, analysing, and summarising.
- **Grouping:** classifying the sources based on their focus.
- **Comparing:** comparing the findings of different studies.
- **Organising:** writing an outline for the content.
- Writing: writing the full review.



Classifying the References

- References cited in a PhD thesis ~150-300!
- Reviewed sources ~500-1000!
- Checked sources (unreviewed) ~2000 papers.



How to review a paper (Not!)





Evaluating the Sources

R. E. V. I. E. W.

- Relevance: Is it of <u>full or partial</u> relevance? <u>Specific or general</u> aspects?
- Expertise: of the <u>authors</u>, research <u>specialisation</u>, <u>background</u>, <u>highly-cited</u>?
- Viewpoint: Possibility of <u>conflict of interest</u> (e.g. industrially-funded research?), purpose of the publication: marketing, scientific, informative, etc...
- Intended audience: scholarly audience, general public, or the industry?
- Evidence: Are the views supported by scientific evidence (e.g. validated models, confirmed observations, etc...)? Has it been peer-reviewed? Citing other researchers, or too many self-citations?
- When published: Was the reference published recently? Have significant developments been made in the subject area since the reference was published?

Masters et al., University of Sydney, 2010



Tools to Sort the Literature

- EndNote.
- Writing summaries.
- Notes on cards.
- Charts.
- Spider maps.
- Tables







Paper Review

An Example

\rightarrow 12 Title Heat Input and Temperature Distribution in Friction Stir Welding Authors Tang, Gui, McClure, and Murr Paper Number Journal of Materials Processing and Manufacture Science (1998) Journal Real-time temperature measurements for AA6061-T6 welds. Welds of dimensions 304×101×6.4mm were used. A tool shoulder and pin diameters of 19 and 6.5 mm respectively. Rotational speed values of 300, 400, 650, 1000 rpm were used with only 2mm/sec feed rate. Thermocouples were located 101 mm from the beginning of the weld in order to stabilize the measurements, at distances of 4, 8, 12, and 16mm from the weld centerline, at depths of 1.59, 3.18 and 4.76 mm. The following findings were found: 1. The material does not melt in these locations. The maximum recorded temperature was 450°C, which is below 582°C. 2. The BM microstructure was characterized by dense dislocation cells and tangles, while in the DRX grains of the FSW has reduced dislocation activity, and homogeneously distributed precipitates. Summary Key points 3. In HAZ, a precipitation phenomenon takes place showing GP precipitates and Widmanstatten plate-like precipitates. This took place in Aims the regions experiencing temperature ranges from 450°C to 398°C and Methodology 363°C respectively. 4. Variations in temperature across thickness are not high. Key findings 5. The higher the welding pressure, the more the thickness reduction, and Significance the higher the temperature (also increases with the decrease in the workpiece thickness). Still, the temperature is kept below the melting point. 6. The temperature does not exceed 0.8Tm. 7 Issues to check Despite being old, it is the best thermal measurements so far. It does not Check account for load/force measurements although.



Writing Tips

- One idea per sentence (1-3 lines).
- A paragraph combines a single topic.
- Use punctuation appropriately.
- Consistent grammar.
- Use transition words to link paragraphs.
- The arrangement of the sources can be chronological, or based on similar ideas, combining the contrasting views.
- Each section should 'naturally' lead (flow) to the following section.



Literature Review Mistakes A 'poor' literature review is..

- Reviewing individual papers, rather than concepts.
- Descriptive and not critical.
- Shallow (in level) covering well-established basic concepts.
- Not up-to-date.
- Unstructured & unplanned.
- Lengthy.
- Not leading to focused research questions.



Literature Review Mistakes Reviewing individual papers, not concepts

• The 1-source per 1-paragraph-type

Karadge et al. [24] analysed laboratory scale and real scale samples from blisks of Ti-64, in both as-welded condition and after PWHT. They reported also a strong transverse (T) texture at the weldline in all the laboratory size specimens. This system corresponds to one of the main slip systems of HCP crystal in titanium alloys (see section 2.1.2). It was also found that the change in texture differs depending on the size of the workpiece, real scale specimens showed also weak basal (B) and some sort of rolling texture (R1). In addition to the texture, other differences were detected between laboratory and full scale welds. Real scale specimens showed a wider TMAZ and larger grain size than the laboratory samples. Martensite α ' was found in the weld region, which evidences high cooling rate.



Literature Review Mistakes

Going waaaaay back!



Fig. 3.1 : Evolution of the bicycle from (a) the English hobby-horse (1795) to (b) the modern bike (2004).

Bicycles have undergone few design changes since they were first invented. The earliest known bicycle design dates back to the 1490s, when a student of Leonardo da Vinci sketched a vehicle that looks remarkably like a bicycle of today, Fig. 3.1 [89, 90]. Since 1950, the conventional materials of which bicycles were made (wood, iron and mild steel) have been replaced by a portfolio of newer materials, many of them derived from the aerospace industry that was itself first nucleated by the bicycle: low-alloy steels, filled polymers, alloys of aluminium (now the bike industry standard), magnesium, and titanium, and most recently advanced composites.



Literature Review Mistakes Citing too many references

• Shallow review, with no details or critical analysis of the sources.

Extensive studies are carried out in FSP in order to make it cost effective in the aerospace and automotive industries. Many researchers have taken up the microstructural investigation of various friction stir welded and processed aluminum alloys [7-19]. They basically investigated the grain refinement in the processed and heat affected zones and it has been observed that the FSP of commercial 1100, 2024, 5083, 6061, 7075 and 7475 Al alloys result in significant enhancement of superplastic properties. Different material properties like tensile strength, microtexture, fatigue and hardness are also being examined for different alloys of aluminum [20-34].



A 'Good' Literature Review Being Critical

The majority of metallurgical studies on LFW of Ti-alloys have focused on LFW of Ti-6Al-4V [5-11], which is a two phase $\alpha + \beta$ titanium alloy with a β -volume fraction of about 5-10 wt.% [12], and is typically considered the workhorse of the titanium alloys. Nonetheless, these studies have suffered from a number of shortcomings. >First, the influence of the process parameters on the residual stress and microstructural development is rarely investigated, with the exception of the work by Wanjara and Jahazi [5], which focused on the microstructure-mechanical property relations>Second, the microstructural studies show some degree of inconsistency, with respect to the presence of martensitic (a') [6,7], or Widmanstätten structures [5]>Third, limited work is presently available on the crystallographic texture development in the weld region as a result of the severe thermomechanical deformation associated with the process [7] Finally, previous investigations of the residual stress development in Ti-6Al-4V welds using neutron and synchrotron X-ray diffraction [6,9] did not consider the possible variation of the strainfree lattice parameters in the weld regions, which is expected to affect the accuracy of the strain measurements and residual stress calculations. Thus, it is the aim of the present investigation to address some of these shortcomings in the LFW literature to fill the available gaps in this area.



A 'Good' Literature Review

Cummoricina

Alloy	Treatment	Peak range	Explanation	Energy release	Source
Pure Al	Torsion (-196 °C, strain=6.75)	-40-0 °C	Recrystallisation	69.6 J/mol	[24]
Pure Cu	Rolled ($\mathcal{E} = 0.32 - 3.35$)	250-450 °C	Recrystallisation	10-45 J/mol	[77]
Pure Cu	Rolled ($\mathcal{E} = 0.5 - 1.2$)	275-550 °C	Recrystallisation	5-30 J/mol	[92]
Cu/Cu-Al	Shock-deformed ($\mathcal{E} = 0.25$)	275 °C	Recrystallisation	7-30 J/mol	[93]
Ni	ECAP, torsion	250-410 °C	Recrystallisation	33-345 J/mol	[95]
Pure Ni	Rolled ($\mathcal{E} = 0.2-2.5$)	400-630 °C	Recrystallisation	5-45 J/mol	[94]
Pure Fe	Rolled ($\mathcal{E} = 0.8$)	400 °C	Recrystallisation	15.1 J/mol	[96]
AA1145 DC AA1145 CC	Rolled (85% reduction)	304-419 °C 302-432 °C	Recrystallisation	11.3 J/mol 22.6 J/mol	[97]
AA1145 AA8011	Rolled ($\mathcal{E} = 0.22 - 1.39$)	319-418 °C 286-388 °C	Recrystallisation	2.3-9.6 J/mol 1.1-13.5 J/mol	[98]
1xxx	Compressed (60% reduction)	400-460 °C	Recrystallisation	0.41-0.46 J/g*	[100]
AA5052	ECAP ($\mathcal{E} = 4-8$)	300-400 °C	Recrystallisation	1.11.15+01.1.1	[101]
Al-2.5Mg	Rolled ($\varepsilon = 0.1-3$)	120 °C 300-450 °C	Mg-clusters Recrystallisation	 0-0.39 J/g	[102]
Al-7.6Mg	Cryogenic ball milling	100-230 °C 370 °C	Recovery Recrystallisation	450 J/mol 410 J/mol	[103]
AA1xxx	H19 (extra hard temper)	300-350 °C 398 °C	Recovery Recrystallisation		[99]

Table 2.8. Typical stored energy values for different materials measured by DSC

*J/g = (J/mol)/molar mass in grams



How to Make a Start Summary

- 1. Planning: create a roadmap of the areas of literature that you need to cover.
- **2. Critical reading:** classify the references, summarise, and indentify the gaps.
- **3. When to stop reading:** cover from recent to 10-20 years ago, focusing on review papers.
- **4. Write:** stop your experimental work every 6-8 months to write parts of your literature review.
- **5. Keep yourself updated:** follow recent papers by setting keyword updates on the databases.



It's always good to have a plan!

GYOUR THESIS OUTLINE NOTHING SAYS "I'M ALMOST DONE" TO YOUR AD' SPOUSE/PARENTS LIKE PRETENDING YOU HAVE





Planning a paper

- what are your conclusions?
- what is the evidence for your conclusions?
- why are your findings important?
- could someone else replicate them?
- tell "a good story"



CALVIN AND HOBBES













Constructing a Paper

- what are your conclusions?
 - series of simple statements summarising your findings
 - statements that will be accurate even if quoted out of context
 - this is what you want your audience to remember
 - NEVER include information in the conclusions that hasn't been fully discussed in the document



Constructing a Paper

- for each conclusion, make a subsection in the Discussion section
- write down the EVIDENCE for your conclusion
 - your results
 - previous published work



Structure of a Paper





Discussion

- relate your results to current knowledge in the field
- relate your results to the original purpose in undertaking the project: have you resolved the problem?
- point out the features and limitations of the work
- what have you contributed?
- briefly state the implications of your results and (if appropriate) suggest further study or applications



Constructing a Paper

- the EVIDENCE from your work that you cite in the Discussion section is the most important part of your Results section
- do you show that evidence as clearly as possible in your figures?
- do you describe those figures to highlight the evidence as clearly as possible?



Structure of a Paper





Structure of a Paper




Constructing a Paper

- the EVIDENCE from your work that you cite in the Discussion section is the most important part of your Results section
- do you give enough information in the Experimental Method so that an experienced researcher could repeat your experiments and obtain the same results?



Structure of a Paper

Conclusions









Experimental Method

- give sufficient information about your materials and methods that an experienced researcher could obtain comparable results
- when using a standard method, cite the appropriate literature and give only the details needed
- describe apparatus only if it is not standard or not commercially available
- describe the procedures used, unless they are established and standard
- note and emphasise any hazards



Constructing a Paper

- the EVIDENCE from OTHER work that you cite in the Discussion section is the most important part of your Introduction.
- do you introduce that literature evidence as clearly as possible?
- you do not have to describe the literature in detail except where directly relevant
- do you introduce the context so that the aim of your work is clear



Structure of a Paper





Structure of a Paper

Introduction



Introduction

- a clear statement of the problem or project and the reasons that you are studying it
- this information should be in the *first few sentences*
- give concise and appropriate background information of the problem, significance, scope, and limits of your work
- prepare your audience for reading the remainder of the document



Constructing a Paper

- what is the aim of you work
- did you succeed?
- look at your Conclusions



Structure of a Paper

Introduction



Structure of a Paper



Constructing a Paper

- persuade people to READ your paper
- your Abstract should make clear
 - -context
 - aims
 - conclusions
 - evidence
 - methods



Style Matters for Scientific Writing



http://www.oup.com/us/samplechapters/0841234620/?view=usa



- How is your work different from that described in other reports on the same subject? (Unless you are writing a review, be sure that your paper will make an original contribution. Some publishers, including ACS, do not publish previously published material.)
- What is the best place for this paper to be published-in a journal or as part of a book? If a

Lorrin R. Garson Editors

- writing style
 - logic
 - choice of words
 - sentence structure
 - "voice"
 - tense
- use of figures
- use of tables
- units
- citing references



be brief

- "I regret to say that at this point in time I do not have access to the specific information that you require."
- "I don't know."



be brief

on account of the fact that as if if it is assumed that a sufficient number enough a greater length of time longer it may well be that perhaps make an examination of examine consider take into consideration it is apparent, therefore, that hence come to the conclusion conclude in view of the foregoing SO in all other cases otherwise



which is more useful?

- "After a long and difficult development cycle due to factory renovation, the infrared controller will be ready for production."
- "The infrared controller will be ready for production on March 4th. Its development cycle was slowed by the factory renovation."



be precise...

John told Robert's son that he should help him.

If the baby does not thrive on raw milk, boil it.



punctuation

The Prime Minister said the Leader of the Opposition is a fool.

The Prime Minister said "the Leader of the Opposition is a fool".

"The Prime Minister", said the Leader of the Opposition, "is a fool".



placing words...

- Only the largest group was injected with the test compound.
- The largest group was only injected with the test compound.
- The largest group was injected with only the test compound.
- The largest group was injected with the only test compound.



be direct

"This reaction is not uncommon."

- This reaction is common.
- This reaction is not rare.
- This reaction occurs about 40% of the time.



use the correct tense

- simple past tense: what was done by you or others, e.g.
 - The alloy was heat treated at 400 °C.
 - Jones **reviewed** the literature and found...
- present tense: statements of fact, e.g.
 - Incorrect heat treatment **leads** to premature failure.
- present and past tenses may both be correct for results, discussion and conclusions, e.g.
 - The TEM images **show** the formation of precipitates.
 - The presence of precipitates was confirmed by TEM.
 - Precipitation **occurs** as a result of heat treatment.
 - Precipitation **was** found in the heat-treated alloy.



"passive" and "active" voice

- the "passive" voice is commonly used for scientific writing:
 - "an experiment was performed" rather than "we performed an experiment"
- use the "active" voice when it is more direct and less wordy:
 - "The fact that heat treatment controls precipitation was demonstrated by our work in this area."
 - "We found that heat treatment controls precipitation."



using the first person

- use the first person (I or we) when it helps to keep your meaning clear and to express a purpose or a decision
 - Jones reported xyz, but we found...
 - My (or our) recent work demonstrated...
- never use personal opinions... or
 - "we believe"
 - "we feel"
 - "we see"



sentences

- short "declarative" sentences are the easiest to write and the easiest to read, and they are usually clear
- too many short sentences in a row can sound abrupt or monotonous
- start with simple declarative sentences and then combine some of them



using paragraphs

- present one main point or idea in each paragraph
- human brains are adapted to taking in "chunks" of information that comprise between five and seven items
- avoid crowding a paragraph with too much information: if it is becoming crowded, split it in two
- paragraphs should be cohesive: avoid disjointed sentences
- leave a clear line between paragraphs
- NEVER start a series of new sentences on new lines



literature review

- YOU are the author of the document
- you are presenting YOUR opinion of previous work in the field and how it relates to your work
- it is not just a catalogue of previous work
- summarise competing ideas, referencing papers as appropriate
- do not describe one paper at a time
- write in well-structured paragraphs
- NEVER start a series of new sentences on new lines



tables

tables should be self-contained

 the caption (above the table) should contain sufficient information to explain the table without reference to the text



figures

- figures should be self-contained
- the caption (underneath the figure) should contain sufficient information to explain the figure without reference to the text
- micrographs need scale bars
- graphs need properly-labelled axes and legends



figures

- don't try to prepare figures in Word labelling tends to become detached
- prepare figures in Powerpoint, then copy into a graphics programme such as Photoshop or Irfanview
- save as .jpg, .png, or .tiff as required
 - use a low resolution version for draft documents
 - figures can easily be updated in powerpoint
- insert in Word "in line with text"



inserting figure captions and cross referencing

- automatically number figure and table captions
- cross reference them in the text
- if you add another figure, all of the figure numbers are automatically updated







The distribution of titanium in the tissue is shown in

4

12

-

1

units

• use SI units





http://physics.nist.gov/cuu/Units/SIdiagram.htm ES Series on Scientific Research
units

- use SI units
- leave a space between the number and its unit, e.g.
 - 200 mV 9 V s⁻¹ 2.6 x 10⁴ J
- don't leave a space for % or °
 50% 90° (but... 90° C)



ES Series on Scientific Research

non-breaking spaces and hypens



citing references

- use bibliographic software e.g. Endnote
- in the text, use a superscript¹ or [1], or an alphabetical reference (Jones, 2005) to cite a reference
- when referring to authors in the text, use
 - "Jones [1]" for one author
 - "Jones and Smith [2]" for two authors
 - "Jones et al. [3]" for more than two authors
 - "Jones and coworkers [4-9] for a series of papers from Jones' group in which Jones is not necessarily the first author

et al. is from the

Latin "et alii", so

you need the "."

for the missing "ii"

• don't use "et al." in the reference list



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EndNote

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Atmospheric corrosion		Buckley	2006	Interpretation of small angle X-ray scattering from alu	Journal Of Alloys A	Journal Arti	<go isi="" to="">://0002</go>	16/02/2010
t Zn	(1)	Buckley	2001	Characterization of H defects in the aluminium-hydro	Journal of Applied	Journal Arti	<go isi="" to="">://0001</go>	16/02/2010
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		Burstein	1984	The Coupled Kinetics of Film Growth and Dissolutio	Corrosion Science	Journal Arti	<go isi="" to="">://WOS:</go>	28/12/2010
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reference data	(1)	Burstein	1993	The nucleation and growth of corrosion pits on stainl	Corrosion Science	Journal Arti	<go isi="" to="">://WOS:</go>	28/12/2010
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Summary

- be brief, precise, clear, and direct
- use the appropriate "voice" and tense
- construct sentences and paragraphs with care
- use SI units
- use clear figures and tables with self-contained captions
- cite references correctly and consistently

