

# **Are You Master of Your Thesis? Part 2**

Making sure your writing reaches your readers

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ECE Language and Communication

ARC Lunch Seminar Feb. 13 2014

1

## **Outline**

- The writing process and structure of thesis
- What makes good technical writing
  - Word level
  - Sentence level
  - Paragraph level

2

Part I

## WRITING PROCESS AND THESIS STRUCTURE

3

### Purpose and reader

- Why are you writing a thesis?
  - Check the requirements for your degree
  - Check the grading criteria
  - Check the course objectives
  - Return to these points from time to time in your writing
- Who are you writing for?
  - General readers
  - Other engineers
  - Experts in the field
  - Think about how to reach each of these readers



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4

## Writing the first draft

- Worry about writing principles later, when revising
- Start by writing less
  - Short, separate sections
- Keep your original purpose/question in mind and organize your work around it
- Most important is momentum
  - Don't get stuck, just move on



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5

## Collect, study and organize your references

- Use librarians for help
- Study the articles as models for academic writing
- Compile a reference database in a reference manager **from the start**



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6

## Pay attention to order and organization

- Consider using outlines
- Each section of the thesis has its own structure

```
Introduction
A. Known/Background
    1. General
    2. Specific reported data
B. Unknown/Problem
C. Research purpose / Question
D. Experimental approach
```

7

## Chapter I, Introduction

1. Explain why the study is needed from a human perspective
2. Clearly define the problem being investigated
  - Without becoming too technical
3. Describe what you will do in the report
  - The scope of your investigation,
  - What kind of methods you will use
4. Describe the location of information in the report
  - But you do have a Table of Contents as well

8

## Chapters 2 +, Presentation of the field

- Expand the background to include theory
- Write for a more informed reader
- Show what you have learned about the field
- Refer extensively to other work here
  - Use published research as well as company reports

9

## Middle of thesis: Your own work

- Clearly distinguish between what you did, and what you found out in your study
- Methods
  - The steps you took to find out the answers to your questions
- Results
  - Including commentary text that points the reader to what is interesting in the figures

10

## End of thesis

- Discussion
  - Analyze your own results
  - Compare your work with related work
- Conclusion
  - Relate back to Introduction
  - Say how you have answered the questions you asked in the beginning
  - Relate your work to the real, broader world
- References
- Appendices

11

## Some good KTH material:

- [Writing a Master Thesis in Electric Power Systems](#)

### **Remember:**

- Use spellcheckers and grammar checkers
- Get other people to read your work
- Leave lots of time for revision
- Save linguistic correctness for last

12

## Write for your reader

- Write to communicate, not to impress
- Focus on clarity rather than creativity



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13

## Four Cs of good composition

Clear	Concise	Coherent	Correct
<ul style="list-style-type: none"><li>• Reader-centered</li><li>• Simply expressed</li><li>• Well-structured</li><li>• Precise</li></ul>	<ul style="list-style-type: none"><li>• Economical</li><li>• Direct</li></ul>	<ul style="list-style-type: none"><li>• Organized</li><li>• 'Glued' together</li><li>• Flows smoothly</li></ul>	<ul style="list-style-type: none"><li>• Grammar</li><li>• Vocabulary</li><li>• Punctuation</li></ul>

14

Part 2

## WORD-LEVEL COMPOSITION

15

### Use precise words

- Choose the word that fits your meaning exactly
  - The current remained increased for **several** hours
  - The current remained increased for **6** hours



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16



## Use simple words

- Verbs instead of noun forms
  - ‘reduced to dryness’ → ‘dried’
  - ‘reflect deviations’ → ‘deviate’
- ‘utilize’ → ‘use’



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17

## Pay attention to collocations

- ‘get funding’ → **receive** funding
- ‘make an experiment’ → **perform** an experiment



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18

## Omit unnecessary words and phrases



- 'not quite sufficiently large enough' → 'not large enough' (or 'too small')
- Most constructions starting with 'it'

In a previous study, it was demonstrated that 'nanowire' devices with excellent sensing characteristics can be defined by TMAH etching

'Nanowire' devices with excellent sensing characteristics can be defined by TMAH etching.

Photo by Michal Marcol

19

## Avoid too many abbreviations

- Limit them to four or five per paper
- Only define necessary acronyms– those that appear often
- Capital letters are superfluous when defining the acronym

wireless metropolitan area network

WMAN

20

## Use correct terminology and nomenclature

- Repeat your key terms rather than finding synonyms

21

Part 3

## SENTENCE-LEVEL COMPOSITION

22

## The location of words within a sentence is important for its interpretation

- Put '**given**' information before '**new**' information
- The **topic** of the sentence should go before the **stress**
  - Wind turbines can harm birds
  - Birds can be harmed by wind turbines

23

## Put the topic at the beginnings of all sentences

A quantum dot is a semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons in all three spatial directions. It has a discrete quantized energy spectrum. A small number (on the order of 1-100) of conduction band electrons, valence band holes, or excitons are contained in a quantum dot. Colloidal semiconductor nanocrystals are small quantum dots, which can be as small as 2 to 10 nanometers, corresponding to 10 to 50 atoms in diameter.

24

**A quantum dot** is a semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons in all three spatial directions. **It** has a discrete quantized energy spectrum. **A quantum dot** contains a small number (on the order of 1-100) of conduction band electrons, valence band holes, or excitons. **Small quantum dots**, such as colloidal semiconductor nanocrystals, can be as small as 2 to 10 nanometers, corresponding to 10 to 50 atoms in diameter.

25

## Create flow by putting familiar information first in the sentence

**Macular degeneration** is affected by **diet**. **One of the diet components** that influences the progression of macular degeneration is **vitamin B6**. Although **vitamin B6** seems to reduce the risk of macular degeneration, it may have some **side effects**. ?

26

## Keep the subjects of sentences short and specific

- Short-term memory fades after 7 items
- Subject + verb should not be more than 9 words
  - The heavily disordered patterns characteristic of interference arising from multiple regions with different phase drops across the junction were eliminated by X (Fig. 2, B and C).

27

## Use the first person (I or we)

- But use it sparingly

	Singular	Plural
1	I	We
2	You	You
3	He, she, it	They

**We** show here that two separate parameters are important to describe the physical effects of an earthquake: seismic moment and radiated energy.

28

## Use the active voice

- 'Cats are hated by dogs' → 'Dogs hate cats'
- Use passive for a reason:
  - When readers do not need to know who or what performed an action
  - To make short subjects
  - To keep emphasis where you want it



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29

## Write short sentences

- Aim for one idea per sentence
- Avoid choppy writing by varying length
- Aim for an **average** sentence length of 20 to 22 words



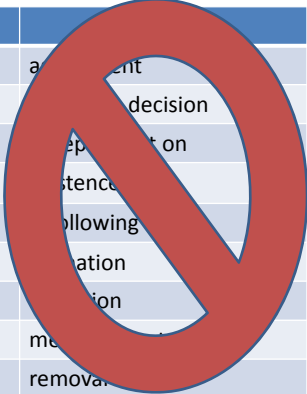
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30

## Use active verbs

- Instead of the noun forms!

assess	assessment
decide	decision
depends on	dependence
exist	existence
follows	following
form	formation
inhibit	inhibition
measure	measurement
remove	removal



31

## Avoid noun clusters

- More than two or three nouns in a row is confusing
- Link nouns with prepositions
- Use hyphens to show relationships if necessary

The negative **penicillin skin test result group** showed no allergic rash.

*The result group that tested negative in the penicillin skin test showed no allergic rash.*

32



## Use clear pronouns

- There should be no doubt as to which noun a pronoun refers to
  - Swedish farmers take good care of their animals. Thus, you can eat **them** with a good conscience.



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33

## Use correct parallel form

Based on our hypothesis, we expected to see a decrease in the infection rate and an increase in survival of patients



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34

Part 4

## **PARAGRAPH-LEVEL COMPOSITION**

35

### **Organize your paragraphs**

- A group of sentences on the same topic
- Clearly marked graphically
- The beginning is the power position
- Flow is maintained through information structure and cohesive devices
- Must be organized to aid the reader

36

## Use a topic sentence for overview

- Says what the paragraph is about
- Usually first sentence
- Often needs to be added in revision phase
- Begins with old information and moves to new

37

## Arrange the details in the remaining sentences

- The middle of the paragraph develops the ideas of the topic sentence
- Examples, justifications, analysis
- Use an appropriate pattern
  - Most to least important
  - Chronological
  - Compare and contrast
  - Problem- solution
  - Cause- effect

38

## Sample paragraph

Volatile organic compounds (VOCs) are emitted from a variety of manmade and natural sources. Manmade sources include motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources. Natural sources responsible for biogenic VOC emissions include oak, citrus, eucalyptus, pine, spruce, maple, hickory, fir, and cottonwood. The overall relative contributions of manmade versus natural sources of VOCs have not been clearly established, but the relative contributions of these source groups vary depending on geography.

39

## Well-organized paragraph

**Volatile organic compounds (VOCs)** are emitted from a variety of **manmade and natural sources**. **Manmade sources** include motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources. **Natural sources** responsible for biogenic VOC emissions include oak, citrus, eucalyptus, pine, spruce, maple, hickory, fir, and cottonwood. **The overall relative contributions of manmade versus natural sources of VOCs** have not been clearly established, but the relative contributions of these source groups vary depending on geography.

40

## What is missing? **A topic sentence!**

### Copper Oxide Superconductors

Two features characterize copper oxide superconductors. One feature is, of course, their unprecedented high transition temperature. The other feature is that their normal state properties are not those of ordinary metals; they are not consistent with the traditional Fermi-liquid quasiparticle picture that is a cornerstone of our understanding of the metallic state.

41

## Make your sentences cohesive

- Move from given to new information
- Use a consistent order of information
- Use a consistent point of view
  - Relate the subjects of each sentence to the topic of the paragraph

42



Rhubarb is a frequently used Chinese herbal medicine. It is used to treat various ailments including constipation, inflammation, and cancer. As a drug, rhubarb is made up of the roots and rhizomes of three members of the *Polygonaceae* family, *Rheum officinale*, *R. palmatum*, and *R. tanguticum*. Different rhubarb species show substantial differences in purgative effects and chemical compositions. However, they are similar in physical appearance and thus difficult to distinguish.

43



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44

## A poorly organized paragraph

Animals, particularly domestic animals, are important reservoirs and sources of disease to humans. Salmonella species are normally found in the intestinal tract of animals such as poultry and cattle. When humans ingest contaminated food, the salmonella can cause disease called salmonellosis. In terms of animal disease transmission, humans often represent a dead end because the disease cannot be transferred from human to human. Salmonellosis may be acquired from animals but the infected human can also serve as a source of disease to other humans.

45

## Here are the subjects:

**Animals**, particularly domestic animals, are important reservoirs and sources of disease to humans. **Salmonella species** are normally found in the intestinal tract of animals such as poultry and cattle. When **humans** ingest contaminated food, the salmonella can cause disease called salmonellosis. In terms of animal disease transmission, **humans** often represent a dead end because the disease cannot be transferred from human to human. **Salmonellosis** may be acquired from animals but the infected **human** can also serve as a source of disease to other humans.

46

## Make organization consistent:

Both GAD-positive cell bodies and processes were found in the  
ventral lateral posterior nucleus and thalamic reticular nucleus.

Almost all of the neurons in the thalamus reticular nucleus appeared to contain GAD immunoreactivity. Only small round cells in the ventral lateral posterior nucleus were GAD positive.

Both GAD-positive cell bodies and processes were found in **the thalamic reticular nucleus and in the ventral lateral posterior nucleus.**

47

## Use key terms to create continuity

- Write with the non-specialist in mind
- Do not change key terms
- Repeat your key terms exactly
- Link terms with words like 'such' and 'another'



To assess original conditions for crystal nucleation and growth in metamorphic rocks, it is necessary to analyze **crystal distribution** quantitatively. **Density** could potentially provide insight into the time scale of mineral growth following the thermal peak of metamorphism.

Photo by Jeroen van Oostrom

48



## Use transitions to indicate logical relationships between sentences

To determine the effects of solid- solution ratio on KI2 adsorption at fixed pH 7, KI2 adsorption isotherm experiments were conducted. ~~For addition,~~ in addition, aqueous carbonate concentrations were measured.



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49

## Use transitions with caution

- Do not overuse
- Some are more appropriate to speech
  - *Besides, so*
- Some are dated
  - *Hitherto, notwithstanding, aforementioned*
- Some meanings are more subtle than you may expect (cp *thus* and *therefore*)

50

## Add transitions and make last two sentences parallel

Substantial arteriosclerotic lesions can be produced by a diet rich in cholesterol. Aside from these lesions, other tissues are also affected by high cholesterol levels. **For example,** The liver undergoes severe fatty degeneration. **In addition,** Pathological changes occur in the rabbit eye.

**the rabbit eye undergoes pathological changes.**

51

## Make your writing concise

- Establish importance
- Omit 'overview' words, phrases, and sentences
- Avoid writing in the negative
- Omit excessive detail
- Do not overuse intensifiers or hedges

52

## Condense this paragraph:

**Note** that the characterization of superconductors involves two quite unexpected features. One is, their unprecedented high transition temperature. In addition, their normal state properties are basically not like ordinary metals, and they are not consistent with the traditional Fermi-liquid quasiparticle picture that is a cornerstone of our understanding of the metallic state.

53

## Even better

Superconductors are characterized by (a) their unprecedented high transition temperature and (b) their normal state properties. Unlike normal state properties of ordinary metals, those of superconductors are not consistent with the traditional Fermi-liquid quasiparticle picture that is essential in our understanding of the metallic state.

54

## Summing up composition

- Write with the reader in mind
- Use precise words
- Use simple words
- Omit unnecessary words and phrases
- Avoid too many abbreviations
- Use correct terminology and nomenclature
- Use syntax to establish importance
- Create flow by putting old information first
- Keep subjects short
- Use the first person
- One idea per sentence
- Use active voice wherever possible
- Use tense consciously
- Organize paragraphs
- Use a topic sentence and supporting sentences
- Use consistent order
- Use consistent point of view
- Make sentences cohesive
- Use repeated and linked key terms
- Condense your writing

**Enjoy writing your thesis!**

55