

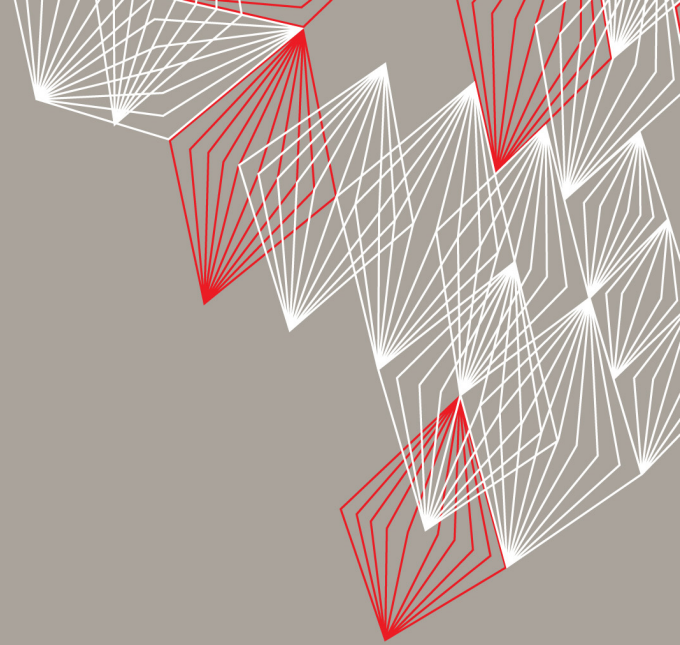


# CRITICAL READING

MARGA KOELEN

[m.t.koelen@utwente.nl](mailto:m.t.koelen@utwente.nl)

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# OBJECTIVES

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- Explain how to use a structured, multi-level approach to read a scientific article,
- Extract and explain key aspects of the article through a quick scan approach,
- Deconstruct one or more paragraphs through more detailed reading.



## WHY LEARN HOW TO CRITICALLY READ A SCIENTIFIC PAPER?

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- Tremendous amount of high-quality research results available via bibliographic databases
- Textbooks are at least five years behind the state-of-the-art
- You must be able to understand the latest developments, and extract what you need for your own work

From: Locate to comprehend to evaluate (technical) information



## WHAT CAN YOU GET OUT OF A RESEARCH PAPER?

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Three steps, increasing difficulty:

1. Comprehension of what the authors are saying
2. Evaluation of their claims
3. Synthesis and motivation for your own research

# DIFFICULTIES

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- The specialized vocabulary may be unfamiliar
- The advanced or specialized methods may be unfamiliar (well beyond textbooks)
- The writing is compact . . .
  - The audience is experienced research scientists with a knowledge of the field covered by the journal;
  - Research papers are fairly comprehensive (“deep”), requiring a good background
- Research papers refer to a large amount of other work in the field. You must understand these before you can fairly evaluate this paper’s claims.



## KEY TECHNIQUE

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You don't have to understand everything . . .

- Find what you need by skimming then going deep as needed
- Skim by following the paper's structure



# SKIMMING A SCIENTIFIC PAPER

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1. Title
2. Keywords
3. Abstract
4. Topic Sentences
5. Structure of the PDF:
  1. Section headings
    - 1.1. Sub section headings
      - 1.1.1. Sub sub section headings . . .
6. Figures and tables



## READ THE TITLE

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### Example

*"Hyperion, IKONOS, ALI, and ETM+ sensors in the study of African rainforests"*

Here we see:

- names of sensors;
- geographic area of application;
- thematic area of application.

This is already something! We can decide if the paper is at all relevant





## READ THE KEYWORDS

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Example:

- African rainforests
- Biomass models. Carbon flux
- Hyperion IKONOS ALI ETM+ Most sensitive Hyperion bands
- Accuracy assessments
- Broadbands Narrowbands
- Hyperion vegetation indices

*Keywords:* African rainforests; Biomass models; Carbon flux; Hyperion; IKONOS; ALI; ETM+; Most sensitive Hyperion bands; Accuracy assessments; Broadbands; Narrowbands; Hyperion vegetation indices

Some more specific concepts here (compared to the title)



# READ THE ABSTRACT

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In less than 300 words the abstract covers

- Rationale Why the work was done
- Objectives What the work was intended to accomplish
- Methods What was done to meet the objectives
- Results What happened when the methods were applied
- Conclusions What the authors conclude from the study

From here you can decide which sections are important to you.

- Note: Abstracts are available in research databases such as ScienceDirect even if the full-text is restricted.



## READ THE TOPIC SENTENCES

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First sentences of a paragraph

## EXAMPLE TOPIC SENTENCES

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In most papers the topic of the paragraph is given in in the first (“topic”) sentence

In this example the topic sentence is:

1. “The ETM+ 8-bit DNs were converted to radiances using the equation: . ” .this is what we were looking for
2. “This can also be expressed as: . . . ” (another form of the equation)

The rest of the section has details of the application of these equations.

# EXAMPLE TOP LEVEL

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The first-level headings are numbered from 1 – 7:

- 1. Introduction and rationale
- 2. Methods – field data collection
- 3. Methods – image processing
- 4. Methods – image data analysis
- 5. Results and discussion – use of images to predict biomass
- 6. Results and discussions – use of images to separate LULC classes
- 7. Conclusions

## EXAMPLE SECOND LEVEL

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The second-level headings under 3 “Methods – image processing” are:

- 3.1 Data sets
- 3.2 Image rectification and registration
- 3.3 Normalization
- Section 3.3 “Normalization” is likely to deal with making images comparable.

## EXAMPLE THIRD LEVEL

The third-level headings under 3.3 “Normalization” are:

- 3.3.1 Hyperion data to radiance
- 3.3.2 IKONOS data to radiance
- 3.3.3 ALI data to radiance
- 3.3.4 ETM+ data to radiance
- 3.3.5 Radiance to reflectance
- 3.3.6 Surface reflectance

Obviously, section 3.3.4 deals with the ETM+ sensor data.

# GOING DEEPER IN THE PAPER

- Figure and table captions (what they are about)
- Figures (visualization)
- Structure (n.b., also in PDF sidebar)
  1. Section headings
    - 1.1. Subsection headings
      - 1.1.1. Subsubsection headings . . .



# EXAMPLES FIGURES AND TABLES

Figures some examples:

- 1.The new generation satellite sensor images of the study area in the Congo River basin, southern Cameroon
- 2.Nine rainforest land use/land cover classes selected for forest classification.
- 3.Allometric dry weight biomass equation development . . .
- 4.Mean spectral profile of rainforest

Tables some examples:

- 1.Image acquisition date and spatial, spectral, and radiometric sensor characteristics of data used in this study
- 2.Distribution of tree, shrub, and weed species in the 30x30 m ground plots
- 3.Highest loaded wavebands for principal components 1 to 5 for each sensor
- 4.Best Hyperion wavebands for predicting rainforest vegetation dry weight biomass



## QUESTIONS TO BE ANSWERED AFTER READING THE/AN ARTICLE

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### ABSTRACT

- 1 Is the abstract easy to understand?

### INTRODUCTION:

- 2 Is there a clear reason for doing the study? Has a “gap” in the field been identified?
- 3 What research questions are asked?
- 4 Has the author reviewed relevant literature, including conflicting or alternative viewpoints?

### METHODS

- 5 If standard methods are used, are adequate references given?
- 6 Are new methods described in sufficient detail for you to repeat or extend the study?
- 7 Are reasons given for using specific methods?



## QUESTIONS TO BE ANSWERED AFTER READING AN ARTICLE

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### RESULTS AND DISCUSSION

- 8 Are the data presented in tabular/graphic form clear?
- 9 Are any statistics or data misleading?
- 10 Where the objectives of the study met? Why/Why not?

### CONCLUSIONS

- 11 What are the main conclusions?
- 12 Are the limitations of the study acknowledged?
- 13 Do the conclusions advance knowledge in your field?



## PRACTICAL TASK

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Read the article by Keshav” How to read a paper”

Use the 3 pass method in the article: “Mapping the data shadows of Hurricane Sandy: Uncovering the socio-spatial dimensions of ‘big data’”