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# Recipes for cooking a successful research paper

## Preparing and publishing a manuscript for a peer-reviewed international journal

### Lecture 2: Writing

Tarmo Soomere  
Estonian Academy of Sciences  
Laboratory of Wave Engineering  
Centre for Non-linear Studies  
Institute of Cybernetics at Tallinn University of Technology

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# Going step by step

- Before you start writing
  - What is scientific publication? Who are its authors? Publishing ethics. Scholarly journals. Citing others. Impact factor. The story, message, carrier, target group.
- Writing: the simplest step of publication
  - Structuring the manuscript: IMRAD. Titles and subtitles. The role of and rules for Abstract, Introduction, Theory, Methods, Results, Discussion, Acknowledgements.
- Supporting and publishing the written message
  - Figures. Figure captions. Mandatory images. Design principles. Tables. Internal and external links & cites. Final formatting. Keywords. Highlights. Submission. Nasty and helpful referees. Proofs.

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# Ready to start?

## Organise the tools

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# The to-do list before writing

- Decide about the target journal
- Download several papers from the target journal
  - written by prominent scientists - native speakers
  - this helps keeping the journal conventions
- Make a compendium of the basic recommendations of the journal
  - Distribute it to all co-authors
- Convert the **message** to a **story**
- Create nomenclature and glossary

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# The first/senior author (in ideal case)

- Obligations similar to a small project leader
- Has an overview of the entire material, message, story
- Divides & coordinates work between the authors
- Makes sure the conventions of the journal (formatting, citing, etc.) and ensures that they are kept
- Keeps the deadlines
- Produces the final "clean" version of the manuscript according to the journal guidelines (up to smallest details!)
- Learns how to submit the manuscript, creates additional material (highlights, Letter to the Editor, csv files for interactive images, etc.)
- Submits the MS and keeps track on the processing
- .....
- **HINT:** This is a LOT OF WORK

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# Where do you need to remember the tasks?

## KARI KALLIO

### Water quality estimation by optical remote sensing in boreal lakes

Department of Environmental Sciences, Faculty of Biological and Environmental Sciences, University of Helsinki  
Academic dissertation

To be presented for public examination with the permission  
Helsinki on 27 January, 2012

List of original publications and author's contributions

PI Kallio, K., Pulliainen, J. & Ylöstalo, P. 2005. MERIS, MODIS and ETM channel configurations in the estimation of lake water quality from subsurface reflectance with semi-analytical and empirical algorithms. Geophysica 41: 31–55.

	PI	PII	PIII	PIV	PV	PVI
Original idea	KK	KK	KK	KK	DP, TK	KK
Study design	KK, PY, JP	KK	KK, TH, JP	KK, SK, JP	TK, KK, DP	KK, PH, UM, TP
Data gathering	KK, PY	KK	KK, TH, JP, TH, TP	DP, AR	UM, KK	
Data analysis	KK, DP, PY	KK	KK, TK	KK, KK, DP, TK, DP	KK, PH	

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**Zoomed table**

	PI	PII	PIII	PIV	PV	PVI
Original idea	KK	KK	KK	KK	DP, TK	KK
Study design	KK, PY, JP	KK	KK, TH, JP	KK, SK, JP	TK, KK, DP	KK, PH, UMH, TP
Data gathering	KK, PY	KK	KK, TH, JP, TH, TP	DP, AR	UMH, KK	
Data analyses	KK, JP, PY	KK	KK, TK, TH, JP, JV	KK, SK, JP	TK, DP, AR, SS	KK, PH, JA, SK
Responsible for manuscript preparation	KK, JP	KK	KK	KK, JP	DP, TK, LT	KK

J. Amla (JA), T. Hannonen (TH), U.-M. Hyttiäinen (UMH), P. Härmä (PH), K. Kallio (KK), S. Koponen (SK), T. Kutsar (TK), D. Pierson (DP), J. Pulliainen (JP), T. Pyhälähti (TP), A. Reinart (AR), S. Sobek (SS), L. Tranvik (LT), J. Vepsäläinen (JV), P. Ylöstalo (PY)

Corollary: at least PhD students have to specify and remember their role (and ensure that the co-authors agree with their viewpoint)

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**The to-do list before writing**

- Download several papers from the target journal
  - written by prominent scientists - native speakers
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**After the choice of the journal: Journal Format and Conventions**

- Ensure familiarity with journal format and style **in all aspects**
- Follow journal convention for annotation and institution
- Do not expect the reviewers/editors to reformat your ms – especially references –
  - you will annoy them
  - you will be seen as lazy
  - Your chances will be smaller

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**Convert the message to a story**

- Start from the 3-4 line message
- Make a roadmap
  - write down a list of topics/themes/points
  - to be presented or proved consecutively
  - These themes/points will serve as starting points of sub-sections
- Separate
  - what other experts probably know
  - what is, technically, new but easy-to-reproduce or learn
    - e.g. wind speed or temperature tomorrow
    - **where is the key development**
- Make copies of the basic literature to be cited and keep them at hand during the writing process
- Do NOT
  - try to start writing the text as one piece from the beginning to the end

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**Make a **glossary**;**  
keep track for **nomenclature**

- Good scientific English: **less is more**
  - Use always the same word for a particular item
  - Limit the use of synonyms
  - Define everything, and keep it!
- Many journals request a glossary of terms
- Highly recommended: create it anyway
  - Especially handy for multi-authored papers
  - Use short, concise explanations
  - If taken from somewhere, add exact reference
  - You need it for the list of keywords, literature search, etc.

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**An example of glossary**

Glossary A.Räämet, PhD thesis, 2010

**Bathymetry.** The description of water depths in oceans, seas and lakes. Bathymetric charts usually show seafloor relief by contour lines called isobaths.

**Diurnal.** A cycle that recurs after each 24 hours.

**Fetch.** The area over which waves are generated by the wind.

**Fetch length.** The horizontal distance in the direction of the wind over which wind waves are generated.

**Frequency of the wave.** The number of waves that pass a fixed point in a given time. The unit of frequency is Hertz, which means waves per second.

**Fully developed sea.** The sea state that forms under suitable conditions when the wind blows for a sufficient time over the open sea. The waves reach their maximum possible height for a given wind speed, fetch length and duration of the wind.

**Geostrophic wind.** The wind which results from the balance between the Coriolis force and the pressure gradient force above the friction layer. Blows parallel to air pressure isobars.

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**Nomenclature and glossary**

**Nomenclature**

$a$	significant wave amplitude (resp. half of the significant wave height)
$A, A_1$	cross-sectional area of the river flow and of the upper layer, respectively
$A_w (= v/ao)$	wave-induced bottom excursion amplitude
$B_0$	dimensionless upstream-section specific energy, $B_{0L} = B_0(L)$
$b, b^*$	bottom and interface elevation, respectively
$dF_{drag}$	boundary drag force per unit mass
$D$	undisturbed water depth

Laanearu et al., Nordic Hydrology 2007

- Nomenclature: description of the symbols
- Optionally with short explanations
- Sometimes merged with glossary

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**Exercises at home:**

1. Formulate a "message" for your next manuscript
  - No more than 400 characters
2. Identify 2-3 suitable journals for the MS
3. Build a roadmap for writing a full research paper
  - Approximately 10-15 sentences or bulleted points, each describing the key aspect to be presented or proved
    - Do not enter details, figures, formulae, etc.
    - Do not think in terms of subsection titles. Try to very shortly formulate the content of what you have to do. Estimate whether you need an image or table to support your point.
    - Try to keep the subsections of more or less equal length
  - Estimate how much work each point will take to be expanded into a subsection of ~1 page, <4000 characters
  - Sum up the result and multiply by a factor of 4. This will give you an estimate of work to be done until the first full draft.

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**Topic I**

Structuring the paper

From a research idea to a full manuscript

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**IMRAD: format of a regular manuscript**

Basic content	Technical details and supporting information
➤ Title	➤ Affiliation
➤ Authors	➤ Acknowledgements
➤ Abstract	➤ References
➤ Introduction	➤ Tables
➤ Material and Methods	➤ Figures
➤ Results	➤ Legends/captions
➤ (And)	➤ Appendices
➤ Discussion	➤ Keywords
	➤ Highlights

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**Procedure**

1. Decide on the message
2. Decide on a journal
  - Download instructions
3. Develop the story
4. Write Material/Methods
  - Start the reference list
5. Summarise results
  - Create figures
  - Create tables
6. Write Introduction and Discussion
7. Finalise the references
8. Assemble/order the tables and figures (in numerical order)
9. Select a tentative title
10. Write the abstract
11. Revise the entire draft
12. Sleep on it
13. Revise the manuscript
  - 1. Repeat (12).-(13)
14. Get approval of all authors
15. Re-read the MS
  - Improve sentence structure
  - Improve word choice
  - Correct typos
16. Ask colleagues to read MS
17. Have the text polished by a native speaker
18. Submit the manuscript

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**General hints & conventions**

- Scientific writing: **Brevity & Clarity**
  - Many journals have limits on length
  - Less is more: avoid ballast

**Usual conventions**

- Introduction: present tense
  - **What** has been previously published
  - **Why** the study was done
- Materials/Methods: past tense
  - **How** the study was conducted
- Results: past tense
  - **what** was found
- Discussion: present tense
  - Explanation of the results;

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**Title**

- ISI WoS: 409 292 769 titles (18.02.2012)
- "Business card" of your work
- Used by many for the first scanning of information
- Not interesting in 0.2 seconds? – nobody reads

The goal: provide specific information in as few words as possible

- ~a commercial or an advertisement
- Usually a phrase
- Can be a complete sentence

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**Title: principles**

- Should be generic – projecting the principles:
  - Cusp formation as a function of granular re-packing,*
  - rather than: *Cusps developed at Pirita Beach, Tallinn.*
  - NOT location specific [=> local interest, not international]
- Short but specific
- Expressing the core development
- Select words suitable for a "running head"

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**Hints for a title**

- Provide specific information
  - in as few words as possible
- Be informative and lucid (easily understood, completely intelligible)
  - Nonlinear components of ship wake waves
  - Joint influence of river stream, water level and wind waves on the height of sand bar in a river mouth
- Include a subtitle, if further detail is needed
  - Fast ferry traffic as a qualitatively new forcing factor of environmental processes in non-tidal sea areas: a case study in Tallinn Bay, Baltic Sea
- You report changes: show the direction
  - Poor: *Effect of amino acids...*
  - Good: *Reversal effect of amino acids ...*
  - In doubt or challenged: *Do amino acids reverse ...?*
- Avoid (nonstandard) abbreviations

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**Hints for a title II**

- Begin with an important term
  - Avoid beginning with *A, The, Results, Study, etc.*
  - Poor: *An experimental study of wind waves and ship wakes in Tallinn Bay (Soomere and Rannat, 2003)*
  - Good: *Sand accumulation under varying lithohydrodynamic conditions in the coastal area of the north-eastern Baltic Sea (Kask et al. 2010)*
- Avoid evaluations
  - Omit subjective terms such as *novel* or *innovative*
  - The reader is appropriate one to make such judgements
  - Poor: *A novel method for determining the molecular weights ..*
  - Good: *A rapid method for determining ...*
- Avoid serial titles
- Check the Instructions to Authors
  - Nature*: no active verbs, numerical values, abbreviations
- Provide a running title (<50 characters)

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**The meaning of Abstract**



- A mini-paper
- Gives actual data in extremely condensed form
  - Presents the core Message
  - Explains what has been done
- Should be understood on its own
  - certainly without reading the paper
- Used as the 2nd level in search for information
- Gateway to the paper: to read or not to read
- Is NOT a plan or indicative summary
  - (these explain what **will** be done)

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**Writing an Abstract**



- Must be concise
- It is NOT a detailed summary of the entire paper
- Normally references not quoted
- Overall: < 1 typescript page
- Usually <150 words or <500 characters
  - No room to waste words
  - A common error: saying "The results will be discussed ..." – tells really nothing

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 The help-file: the shortlist of questions: Why? How? What? 



- **WHY** did you study it?
  - Can be omitted if the objective is clear from the title
- **HOW** did your study it?
  - Elaborated only if the paper is on methodology
  - Otherwise very brief or almost omitted
- **WHAT** did you find?
  - Selectively include only the most important findings
- **WHAT** does it mean?

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 Abstract: 4 components only 

- 1-2 sentences each ONLY!
  - (i) the aims of the paper
  - (ii) the methods & techniques used
  - (iii) the major results or findings
  - (iv) the main implications from the research



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 Curiosities 

Protein Synthesis Group, Shanghai Institute of Biochemistry, Academia Sinica. 1975. Total synthesis of crystalline glucagon by the method of solid state phase condensation of fragments. Acta Biochem. Biophys. Sinica 7:119-138.

**Abstract.** Chairman Mao taught us, "One should seriously sum up one's experience." Looking back at the experiences of our own and of others in the past decade or so on the total synthesis of [...], we have analysed the inherent contradictions of the two alternative routes of synthesis on the basis of the dialectical viewpoint of "one divides into two." [...] A new synthetic strategy was developed ....

Cited from Y.T.Yang, An outline of scientific writing. World Scientific, 1995.

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 A classical example with a redundant phrase 

We analytically investigate the **nonautonomous discrete rogue wave solutions** and their interaction in the generalized Ablowitz-Ladik-Hirota lattice with variable coefficients, which possess complicated wave propagations in time and are beyond the usual discrete rogue waves.

When the amplitude of the tunnel coupling coefficient between sites decreases, these **nonautonomous discrete rogue wave solutions** become localized in time after they propagate over some certain large critical values.

Moreover, we find that the interaction between nonautonomous discrete rogue waves is elastic.



**HOW** did your study it?



**WHY** did you study it?

**WHAT** did you find?

**WHAT** does it mean

Yan and Jiang, 2011



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 Key words 

- They DO NOT reflect the quality of research
- Used for indexing for electronic searching
  - Some journals: Title words are already key words
  - Other journals: Key words must be taken from a specific list
- List 'additional' key words

Modelling of wave climate and sediment transport patterns at a tideless embayed beach, Pirita Beach, Estonia



**Keywords:**  
Sediment transport  
Sediment distribution  
Beaches  
Wave climate  
Wave modelling  
Tallinn Bay

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 Topic II 

Expressing the research

Introduction  
Methods  
Results

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**Typical sequence of reading**

1. Title: Does it have any relevance to my interests?
2. Abstract: Could the paper be important for me?
3. Introduction: Does it give something to me now?
4. Conclusions: Anything to remember?
5. Rest of the paper: dedicated reader, in very few cases

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**The Introduction**

- Read before the rest of the paper
- Perhaps the most difficult part to write
- The purpose: provide the background information that the reader needs to understand your paper
- States the nature of the problem
- Sets the scene
- Leads on to the purpose/aims
- Contains a part of literature

- The reason
- The findings
- Specialized background

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**Hints**

- The reader is assumed to have a basic familiarity with the subject
  - Exclude elementary information
  - Normally no references to standard textbooks
  - Present only what a specialist should know
- Specifies nature and scope
- Gives a brief summary of previous work
  - Just to bring the reader up to date on the topic
  - Including your own previous work
  - Not a place to show your talents
- Aims to evoke interest
- Brief enough to avoid losing the readers' attention

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**"Trinity" of a good introduction**

(I) General background  
(II) Previous findings by others  
(III) Your examination of the questions addressed

➤ Very briefly: your approach  
➤ Ask **The Question**  
➤ [principal finding – on the level of keywords]  
➤ Organisation of the paper

**INTRODUCTION**

```

graph TD
    A[INTRODUCE THE TOPIC] --> B[RELATE TO CURRENT KNOWLEDGE]
    B --> C[INDICATE THE GAP]
    C --> D[INTRODUCE YOUR WORK]
    D --> E[STATE RESEARCH QUESTIONS AND OBJECTIVES]
  
```

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**Example**

The existence of particularly high (freak or rogue) waves on the sea surface is often observed. Freak waves occur much more frequently than it might be expected from surface wave statistics whereas they are particularly steep.

This interesting (and dangerous) phenomenon is explained by various theories (see, for example, Kharif and Pelinovsky [1] and references therein). Stressing the importance of currents, bathymetry, interaction with internal waves, etc. that may contribute to forming of freak waves (see Peregrine [2], Jonsson [3], Shyu and Phillips [4], Donato et al. [5], White and Fornberg [6] and bibliography therein), we focus here on interaction of solitary waves.

**General background**

**Findings by others**

**Our examination**

Soomere and Engelbrecht, Wave Motion, 2005

**Abbreviations and footnotes**

- Abbreviations save space
  - South-western → SW
  - Environmental Impact Assessment → EIA
- Define at the first mention
  - Only reasonable if used >4-5 times
- Footnotes: generally not recommended
- Still extremely useful during writing
  - Additional information that would make the body text too complicated
  - Details of references (which pages, citation)
  - Notes for yourself

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**Literature search and overview**

INTRODUCTION

INTRODUCE THE TOPIC

RELATE TO CURRENT KNOWLEDGE

INDICATE THE GAP

INTRODUCE YOUR WORK

STATE RESEARCH QUESTIONS AND OBJECTIVES

- Usually a part of Introduction & Material & Methods
- Frequently important in Discussion
- Demonstrates your knowledge in the field
- Credits important previous work
- Helps you greatly in putting your work into proper context
- Benefit from large databases

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Try different combinations of keywords to get an overview of work in this field

WEB OF KNOWLEDGE™ DISCOVERY STARTS HERE

Go to mobile site | Sign in | Marked List (0) | My EndNote Web | My ResearcherID | My Citation Alert

All Databases Select a Database Web of Science Additional Resources

Search Author Finder Cited Reference Search Advanced Search Search History

Web of Science™

Search

Baltic Sea wave\* coastal processes  
Example: oil spill\* mediterranean

in Topic

AND

Example: O'Brian C\* OR O'Brian C\*  
Need help finding papers by an author?  
Use Author Finder.

in Author

AND

Example: Cancer\* OR Journal of Cancer Research and Clinical Oncology

in Publication Name

Add Another Field >>

Search Clear Searches must be in English

Current Limits: (To save these permanently, sign in or register)

Timespan

All Years (updated 2012-02-22)

From 1980 to 2012 (default is all years)

Press the button

Example: long-term coastal evolution in the Baltic Sea

**Search results**

Results Topic: (Baltic Sea wave\* coastal processes)  
Timespan: All Years. Databases: SCI EXPANDED, SSCI, ASHCI, CPCI-S, CPCI-SSH, Lennormanskiin-Oi

Note: Alternative forms of your search term (for example, tooth and teeth) may have been applied, in particular for Topic or Title searches that do not contain quotation marks around the terms. To find only exact matches for your terms, turn off the "Lennormanskiin-Oi" option on the search page.

Results: 63 Page 1 of 7

Sort by: Publication Date - newest to oldest

Refine Results Search within results for

Save to: EndNote Web EndNote RefWorks ResearcherID more options

Analyze Results Create Citation Report

Look through titles: could the paper be relevant to your work?

5. Title: Observed carbon dioxide and oxygen dynamics in a Baltic Sea coastal region  
Author(s): Wiesendanger, Kerstin; Hoff, Peter  
Source: JOURNAL OF MARINE SYSTEMS Volume 90 Issue 1-2 Pages 1-9 DOI: 10.1016/j.jmarsys.2010.07.001 Published: MAY 2011 Times Cited: 4 (from Web of Science)

3. Title: A Multiscale Centennial Morphodynamic Model for the Southern Baltic Coast  
Author(s): Zhang, Wenyan; Harff, Jan; Schneider, Ralf; Meyer, Michael; Wu, Chaoyu  
Source: JOURNAL OF COASTAL RESEARCH Volume 27 Issue: 5 Pages: 890-917 DOI: 10.2112/JCOASTRES-D-10-00055.1 Published: SEP 2011 Times Cited: 2 (from Web of Science)

Maybe? Click!

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WEB OF KNOWLEDGE™ DISCOVERY STARTS HERE

Author(s): Zhang, Wenyan; Harff, Jan; Schneider, Ralf; Meyer, Michael; Wu, Chaoyu

Source: JOURNAL OF COASTAL RESEARCH Volume: 27 Issue: 5 Pages: 890-917 DOI: 10.2112/JCOASTRES-D-10-00055.1 Published: SEP 2011 Times Cited: 2 (from Web of Science)

Cited References: 67 (view related records) Citation Map

Abstract: The Dars-Zingst Peninsula on the southern Baltic Sea was formed after the Littorina transgression onset about 8000 cal. y BP. It originated from several discrete islands, has been reshaped by littoral currents and wind-induced waves during the last 8000 y, and evolved into a complex lagoon system as seen today; thus, it may serve as an example to study coastal evolution under long-term climate change. A methodology for developing a multiscale process based morphodynamic model for simulation of decadal to centennial evolution of a wave dominated coastal environment is presented here. The model consists of eight main modules. The two-dimensional vertically integrated current module, the wave module, the bottom boundary layer module, the sediment transport module, the cliff erosion module, and the nearshore storm module are real-time calculation modules that aim to solve the short-term processes. A bathymetry update module and a long-term control function set, in which the "reduction" concepts and techniques for acceleration of morphological update are implemented, are integrated to extend the effects of short-term processes to a longer term (yearly) scale. Successful model validation demonstrates that it is capable of simulating the long-term morphological evolution of the southern Baltic coast. Model results indicate that coastline change of the Dars-Zingst Peninsula is dominated by mechanisms that act on different timescales. The coastlines of Dars and Waddensee Island are mainly reshaped by long-term effects of waves and longshore currents, while coastline change of the Zingst area is a combination of long-term effects of waves and short-term effects caused by extreme wind events.

**Found something to rely on?**

Coastline change of [...] is dominated by mechanisms [...] on **different timescales**. The coastlines of [...] are mainly reshaped by **long-term effects of waves and longshore currents**, while coastline change [...] is a combination of long-term effects of waves and **short-term effects caused by extreme wind events**.

- Note it down immediately
- Save full text of the claim
- Together with full bibliographic information
  - Include the citation and bibl.inf. into the text as a footnote

A Multiscale Centennial Morphodynamic Model for the Southern Baltic Coast:  
Zhang, Wenyan; Harff, Jan; Schneider, Ralf; Meyer, Michael; Wu, Chaoyu.  
JOURNAL OF COASTAL RESEARCH Volume: 27 Issue: 5, 890-917, 2011

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Some papers are more popular than others



Sorted by default: according to publication date

Try: sorted by Times Cited



1. Title: Effects on aquatic ecosystems  
Author(s): Hader DP, Kumar HD, Smith RC, et al.  
Source: JOURNAL OF PHOTOCHEMISTRY AND PHOTOBIOLOGY B-BIOLOGY Volume 14 Issue: 5 Pages: 535-548 DOI: 10.1006/jphoto.1998.00185-7 Published: OCT 1998 Times Cited: 178 (from Web of Science)



2. Title: Fast ferry traffic as a qualitatively new forcing factor of environmental processes in non-tidal sea areas: A case study in Tallinn Bay, Baltic Sea  
Author(s): Soomere T  
Source: ENVIRONMENTAL FLUID MECHANICS Volume: 5 Issue: 4 Pages: 293-323 DOI: 10.1007/s10652-005-5226-1 Published: AUG 2005 Times Cited: 37 (from Web of Science)

Heavily cited papers probably contain something interesting



 **Working with quotations** 



- **Seemingly strange text: 5-7 lines of quotations** in footnotes for each line of main text
- Check from the source whether or not the quotation/fact/result is relevant to your paper
  - Note the exact place/page of the result in the source
- Condense the text iteratively
  - Move a double-checked previous result into the main text
  - Keep the core of quotation
  - Move the bibliogr.inf. into References
  - Group similar and repeating claims

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 **Methods / Experimental procedures** 



- Usually the easiest part to write
  - You do not interpret data or reach conclusions
  - Unless the paper is on methodology
- References to standard textbooks are fine
- Briefly summarise
  - Basically the reader should be able to repeat the work
  - And judge whether your procedures were sufficient
- Refer to authoritative standard methods
  - e.g CERC method for wave-driven sediment transport
- **Reference others** who have used the same
- Note differences
- Give details only if a “new method” is the purpose of the paper

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 **Theory and Background** 



- Very much the same as Methods
- Literature search normally necessary, see above
- **Reference others** who have used the same methodology or theory
  - Web sites are not authoritative references (no quality control)
- Refer to authoritative standard methods
- Concise but explicit
- Verbs usually in the past tense
  - **Prefer:** Enzyme A was purchased from Sigma
  - **Worse:** We purchased enzyme A from Sigma
  - because here emphasize should be on the material, not authors

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 **Materials / Data** 



- **Very much the same as Methods**
- Describe data acquisition procedure
- Indicate possible uncertainties/errors or inhomogeneities
- Give an estimate of accuracy/error (both physical and of the procedure), reasons of exclusion of some data points (if any)
- Use subsections if necessary
  - Rule of thumb: one printed A4 double-spaced page – one subsection
  - Subsection titles – “small sisters” of the Title

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 **Results** 

- Feature main results of the stated aims of the paper
- Present ‘analysed’ data, not raw data
- Present as:
  - tables
  - graphs, or
  - model figures where possible

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 **Results: additional hints** 

- Results: general statements that **interpret** the raw data
- The “meat” of a paper
  - The most important part
  - All other sections are subordinate
  - Can be of any length
- Sometimes combined with Discussion

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**Writing the Results section**

- Emphasize only important information or observations
  - that will answer **The Question**
- Be selective
  - Detailed data belong to Material or an Appendix
- Structure the text so that emphasis is on results
  - Place the results sentence at the beginning of a paragraph
  - Subsequent sentences provide supporting details
  - Put ancillary information in a subordinate clause
  - Use the active/passive voice to emphasize the right element

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**Writing the Results section II**

- Explain only those illustrations and tables whose significance is not obvious to the reader
  - Do NOT repeat the data
  - Do NOT repeat the Fig. legends and Table titles in the text
- Be sure that the text, illustrations and tables are consistent with each other
  - Wave height in a Table is 0.82 m and in the text 0.92 m??
- Analyse your data with standard statistical methods
  - Draw confidence intervals
  - Analysis of variance, statistical significance, etc.
- Be honest
  - Do NOT omit data that do not support your hypothesis and conclusion
  - even if you might be attacked for showing bad data

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**Topic III**

Elements and bricks of writing

From words to paragraphs

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**Two ways of saying things**

The major reason for including two simulated data sets is that these sets reflect somewhat different features of waves in the study area. 136 char

The two simulated data sets reflect somewhat different features of waves in the study area 85 char

(You have reason anyway!)

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**Economic use of words**


- Communication is better through concise and lucid writing in a well-organised manner
- Avoid uninformative words
- Brief ~~in duration~~
- Sufficient ~~in number~~
- The wound was ~~of serious nature~~
- The solution was ~~red in color~~
- It was precooled ~~before use~~
- We repeated the experiment ~~again~~

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**Economic use of words II**

- Many popular expressions can be expressed as a single word, or are better omitted altogether
- At this point of the time now
- The reason was because because
- In view of the fact that because
- Was observed to be was
- In most cases mostly
- ~~It would appear that~~
- Is suggestive of suggests
- As to whether whether
- In the vicinity of near
- It was evident that evidently
- In the event that if

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## Economic use of words III

- Avoid grandiloquence = pompous style
- Impresses no one and provokes ridicule
- Avoid clichés and euphemisms
  - All in all → delete
  - If and when → if
  - The patient breathed his last → The patient died
- Use exact synonyms
  - Words that have nearly the same meaning
- Use **thesaurus**
  - Check the exact meaning of words from a dictionary, Google, Wikipedia etc.



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## Alternatives to one word "marked"

➤ Appreciable	➤ Extensive
➤ Considerable	➤ Extraordinary
➤ Conspicuous	➤ Large
➤ Extreme	➤ Notable
➤ Great	➤ Noteworthy
➤ Intense	➤ Noticeable
➤ Signal	➤ Pronounced
➤ Significant	➤ Strong
➤ Striking	➤ Substantial
➤ Decided	➤ Unusual
➤ Definite	➤ Astonishing
➤ Distinct	➤ Enormous
➤ Remarkable	➤ Important
➤ excessive	➤ Profound
	➤ ...



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## Steering emphasis

**Figs. 2.13 and 2.14 illustrate geographical distributions of amplitudes .....**


### Emphasis is on the figures


An **interesting feature** of geographical distributions of amplitudes (Fig. 2.13, 2.14) is that ....

### Emphasis is on the interesting feature



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## Building a sentence

- A good sentence is **topical**: begins with the important item
  - The relationship  $F=ma$  was discovered by Newton
    - Suitable in a text on the history of physics
    - Newton discovered the relationship  $F=ma$ 
      - Suitable in a biography of Sir Isaac Newton
  - As short as possible
    - Avoid ambiguities
      - "The monkey was operated on by the surgeon when he was six weeks old"
      - "The monkey, when he was six weeks old, was operated by the surgeon"
  - Being clear has the priority over perfect style
    - "... as of September 1, 257 people were dead ..." **How many?**



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## The importance of being unambiguous I


Bilham, The 1737 Calcutta Earthquake and Cyclone Evaluated, *Bull. Seism. Soc. Amer.* 84(5), 1650-1657, 1994.

Summary: Despite repeated citation by elementary texts on seismology (and hence by the popular press) of an earthquake involving 300,000 deaths in Calcutta in 1737, it is very probable that no earthquake occurred. A cyclone drove numerous ships ashore, but the death toll in Calcutta was a fraction of its total 1737 population of 3000. One of the primary sources cited incorrectly by investigators prior to the present account, is identified and attributed to London Magazine (1738).


### The 1737 Calcutta Earthquake and Cyclone evaluated


Roger Bilham

**Abstract** Catalogs of historically devastating earthquakes (e.g. Dunbar et al. 1992) contain an entry for an earthquake in Calcutta in 1737 that is held responsible for the loss of 300,000 lives thus rendering it one of the three most disastrous earthquakes in history. Yet evidence for a severe earthquake is weak, consisting of anonymous reports conveyed to Europe 6 months later by merchant ships returning from Bengal. Official accounts of the disaster submitted to the East India Company headquarters in London list 3000 fatalities and omit mention of an earthquake. If the 11 October 1737 Calcutta earthquake is to remain on lists of catastrophic earthquakes the following issues need to be resolved: the discrepancy between the 1737 urban population of Calcutta (<20,000) and the number of claimed fatalities, the difficulty in distinguishing between damage from shaking and hurricane force winds and flooding that occurred during the same night, and the contradiction between the numbers of nocturnal deaths and the apparent earthquake resistance of thatched roof dwellings typical of 18th century rural Bengal. It is possible that earthquake damage may have been minimal or non-existent.



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## The importance of being unambiguous II: stupid errors are extremely long-living


### Ten deadliest natural disasters

Rank	Death toll (estimate)	Event	Location	Date
1	1,000,000–4,000,000 <sup>[1]</sup>	1931 China floods	China	July, August, 1931
2	900,000–2,000,000 <sup>[2]</sup>	1887 Yellow River flood	China	September, October, 1887
3	830,000 <sup>[3]</sup>	1556 Shaanxi earthquake	China	January 23, 1556
4	242,000–779,000	1976 Tangshan earthquake	China	July 1976
5	500,000–1,000,000 <sup>[1]</sup>	1970 Bhola cyclone	East Pakistan (now Bangladesh)	November 13, 1970
6	300,000 <sup>[4]</sup>	1839 India Cyclone	India	November 25, 1839
7	300,000 <sup>[1]</sup>	1737 Calcutta cyclone	India	October 7, 1737
8	273,400 <sup>[4]</sup>	1920 Haiyuan earthquake	China	December 16, 1920
9	250,000–300,000 <sup>[1]</sup>	526 Antioch earthquake	Byzantine Empire (now Turkey)	May 526
10	260,000 <sup>[3]</sup>	115 Antioch earthquake	Roman Empire (now Turkey)	December 13, 115

Wikipedia, accessed 12 Nov 2013



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**Bricks of writing: paragraphs**

- A paragraph = step in your story
- Describes a clearly identified part of the content
  - Remember "roadmap" for writing
- Normally 5-10 lines, 3-7 sentences
- **Organise each paragraph!**
- Start with a topic sentence
  - that explains the main point or idea
- Subsequent sentences provide the detail
  - This formula: sometimes considered less polished
  - But direct and intelligible; thus, perfectly acceptable
  - Start with this style, adjust when you gather experience

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**Writing a good paragraph**

- Each paragraph expresses/covers only one point
- Each sentence establishes or supports this point – the topic of the paragraph
  - The sentences should illustrate their overlapping effect
- Explain why actions were taken
  - "All of the patient data were kept in paper files. The absence of even one clerk caused delays in the monthly reporting. Finally, management decided to interview some systems analysts"
  - "All of the patient data were kept in paper files, **which took too much staff time to maintain**. The absence of even one clerk would delay the monthly patient reports. **Management wanted computerised recordkeeping, which would take less time and be more reliable, and finally decided to interview some systems analysts to develop the new system**"
  - From J.T. Yang, An outline of scientific writing.

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**Writing a good paragraph II**

- Keep a consistent point of view
  - Maintain the same grammatical voice (act/pass):
    - "Topical applications of the drug **did not improve** the condition. The condition improved after small doses were delivered intravenously"; passive + active
    - "Topical applications of the drug **did not improve** the condition. Intravenous delivery of small doses improved the condition"
    - From J.T. Yang, An outline of scientific writing.
- Maintain consistent structure
  - Sometimes attempts to avoid monotony hinder comprehension

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**Scattered hints**

- Follow either American or British style
  - but never a mixture of both (e.g. -ize/ise)
- Be careful with several adjectives in sequence
  - Sometimes the most concise is not the clearest
    - "Simian virus transformed fetal mammalian heart fibroblast"
    - "Simian virus-transformed fibroblast from fetal mammalian heart"
- Phrases longer than 3-4 words from other sources **MUST** be highlighted as quotations
  - Even if coming from your own previous work
  - Slightly longer quotations without special highlighting is sometimes accepted in review works and monographs

Note the importance of the hyphen!

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**Writing: general**

- Use the past tense of verbs except for Figures and Table
  - "Table 1 contains data collected over a three-week period."
- Terms beginning a sentence: fully spelled out
  - Usually: "Substituting Eq. (1) into [...]"
  - BUT: "Equation (1) reveals that ..."
  - (unless custom abbreviations such as DNA, Dr., et.)
  - Do NOT start a sentence with a numerical or symbol
  - Numbers in a sentence should start with a decimal point
  - .476 is not good; use 0.476

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**Topic IV**

The tough part of writing and decisions:

Discussion  
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**Discussion or IEEE**

- Takes the data reported in the Results section
  - **Interprets** the findings
  - **Emphasizes** what is new
  - **Evaluates** their significance
  - **Examines** the implications
- Usually the most challenging section to write
- Demonstrates how well you understand the results
- No need to be lengthy
- Sometimes merged with Results or Conclusions

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**Discussion: hints by Terry Healy**

- **Elaborate** upon the findings
- **Emphasise** what is new, different to earlier authors
- **Refer** extensively to other authors
  - Another valid style: no references in Discussion (UCL)
- **Place** your contribution in relation to existing published work and programs
- **This is an essential characteristic of a paper for international readership**

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After Hengi and Gould (2006)

**DISCUSSION**

- **Move from specific to general**
- Start with **The Question** posed in the Introduction
- This question should be answered now – by a chain of arguments
- Specify what exactly is interesting and what is expected
- **The beginning and ending of Discussion: prominent places for important ideas**

ANSWER RESEARCH QUESTIONS  
SUPPORT AND DEFEND ANSWERS WITH RESULTS  
EXPLAIN:  
- Conflicting results  
- Unexpected findings  
- Discrepancies with other research  
STATE LIMITATIONS OF THE STUDY  
STATE IMPORTANCE OF FINDINGS  
ESTABLISH NEWNESS  
ANNOUNCE FURTHER RESEARCH

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**Writing a good Discussion**

- Begin with a topical sentence that returns to **The Question**
- Mention shortly **new** findings, knowledge or concepts that resulted from your study
  - Do NOT introduce again data or methods that were already presented
  - Do NOT introduce data that were not presented in the text before
  - Do NOT copy sentences from Results
- State whether you have achieved your goal
  - Perhaps found exceptions? Unexplained effects?
- Compare your results and interpretations with previously published work
  - Even though it may disagree with yours
  - Give fair credit to others whose work has been confirmed. Cite!
  - Be fair with those whose results differ
  - Explain, if possible, the disagreement impartially
    - From J.T. Yang, An outline of scientific writing.

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**An example of internal separation of conclusions**

**BSSC** 8<sup>th</sup> Baltic Sea Science Congress 2011  
22-26 August, 2011, St. Petersburg, Russia

**Decadal variations of wave-driven sediment transport processes in the Gulf of Riga**

Katri Kartau, Maija Viška, Tarmo Soomere



Institute of Cybernetics at Tallinn University of Technology  
Wave Engineering Laboratory

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**Conclusions matching the existing knowledge**



- The rate of the bulk transport and net transport is the largest to the north of Akmenrags Cape, along the NW coast of Latvia
  - and in a short section in the westernmost area on the Sambian Peninsula.
- The bulk transport in the Baltic Proper considerably exceeds that along the entire Gulf of Riga
- Longshore variations in the bulk transport mostly follow the changes in the orientation of the coastline
- There is an overall increase in the bulk transport rate
  - this increase matches the increase in wind speed over the northern Baltic Proper
- The net sediment transport along the entire coast is always to the (north)-east, or clockwise in the Gulf of Riga.

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 **Interesting conclusions** 



- Biggest variability in the net transport occurs in the north-western coast of Latvia
- The net transport in the Gulf of Riga considerably exceeds that along the southern part of the study area (contrary to the bulk transport)
  - The coast of Kaliningrad District and Latvia may be in almost equilibrium state whereas the coast of Gulf of Riga are far from equilibrium
- Temporal course of both bulk and net transport show a clear presence of a signal with a typical scale of about 10 years
- Long-term course of net transport shows no clear trend
  - An increase up to ~1995
  - A decrease since then
- The course of both net and bulk transport in the Gulf of Riga decoupled from the similar course along the Baltic Proper coast

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 **Writing a good Discussion II** 



- Take care to label speculations as such
  - Journals permit some reasonable speculations if based on solid evidence
  - You can refer to published speculations as a starting point of new research
- Discuss any theoretical implications and possible applications
- Present the conclusions concisely, **do not repeat**
- Suggest the future studies, if any
- End with a short summary or conclusion
- Do NOT repeat material from other sections
  - From J.T.Yang, An outline of scientific writing.

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 **Summary and Conclusions** 



- Summarise major findings
- List in importance (bullet points or numbers)
- Remember: many read only the Abstract and Conclusions
- Refer to aims/purpose of the paper

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 **Acknowledgements** 



- Used to give credit to those who have materially or intellectually contributed to the research
  - Technical assistance
  - Advice from colleagues
  - Other research-related contributions
- Do NOT include: Contributions that do not involve research
  - Clerical/administrative assistance
  - Word processing, Translation, Copy-editing
  - Encouragement from friends
- Refer to funding assistance
  - Mandatory for research supported by targeted financing in Estonia from 01.01.2010
  - Success of Estonian Science Foundation grants counted based on paper with the relevant acknowledgement

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 **Authorship versus crediting in Acknowledgement** 

- **Authorship is limited** to those who have made a **significant contribution** to the conception, design, execution, or interpretation of the reported study.
- **All** those who have made **significant contributions** should be listed as co-authors.
- Others who have participated in **certain substantive** aspects of the research project should be acknowledged or listed as contributors

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 **Acknowledgements II** 

- Keep short
  - A standard formulation:
    - "This work was supported by the Estonian Science Foundation (grant No. 9125) and targeted financing by the Estonian Ministry of Education and Research (grant SF0140007s11). We thank Prof. A.X for his comments on the manuscript and Dr. X.Y.Z. or his technical assistance."
- Be aware of misinterpretations
  - Maybe Dr. X.Y.Z performed the experiments and Dr. A.X explained the data,
  - and your contribution was limited to being the armchair general?
  - Make certain that Acknowledgements accurately reflect the situation
- Obtain prior permission from the person being acknowledged
  - Maybe he/she only read the draft and fully disagreed with your treatment?
  - Maybe he/she should be a coauthor?

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