

# Hvordan skrive en vitenskapelig artikkel?

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**Success in research needs four Gs:  
Glück, Geduld, Geschick und Geld.  
{Flaks, tolmodighet, ferdigheter og penger}**

– Paul Ehrlich 1854-1915  
[In N.Perutz, *Nature*, 1988, Vol. 332, p. 791]



I en forskerutdanning lærer man mye, men ikke det viktigste av alt: Publisering.

# Unge forskere kan for lite om publisering

- Hva er det viktigste du vil lære bort?
- Artikkelen bør ha et veldig klart budskap. En take-home-message. Velg ut **ett** klart resultat fra forskningen din, og skriv tydelig om dette ene resultatet. Når du sender inn en artikkel: Ikke vær redd for å bli avvist. Det skjer hele tiden. Ikke vær redd for at eksperimentet ditt ikke er perfekt. Tro på deg selv, og være stolt av arbeidet du har gjort. Hvis du har levert et skikkelig stykke vitenskapelig arbeid, fortjener du anerkjennelse i form av en publikasjon, sier hun.

# Unge forskere kan for lite om publisering

Å publisere er en forskers plikt, legger hun til.

– Bare publisert forskning kan komme andre til gode. Derfor er det vår plikt å publisere resultatene våre - for menneskehetens skyld.

# Publisering – det endelige målet

- Målet med vitenskapelig forskning er publisering.
- Forskere, inkludert doktorgradsstudenter, måles primært
  - ikke av deres dyktighet i laboratoriemanasipulasjoner,
  - ikke ved deres kunnskap om verken brede eller smale vitenskapelige emner, og sikkert
  - ikke av deres vidd eller sjarm;
- de måles, og blir kjent (eller forblir ukjente),
  - av sine **publikasjoner**.

[Day, 1989]

# Publisering i realfag har gått i været

To fagområder har hatt en spesielt stor vekst, viser ny kartlegging av hvor mye norske forskere publiserer.

## Mest publisering i medisins- og helsefag

Alt i alt er det innenfor hovedgruppen medisins og helsefag det publiseres mest i Norge.

Aller høyest publiseringstall hadde fagfeltet klinisk medisin, hvor norske forskere bidro på nesten 4000 publikasjoner i 2022.

Antallet publikasjoner innen klinisk medisin økte med 34 prosent i den undersøkte perioden.

### Her er oversikten over hvilke fagfelt som hadde høyest publiseringsvolum i 2022:

Page 1 of 2 >

| Fagområde                          | Publikasjoner 2022 |
|------------------------------------|--------------------|
| Klinisk medisin                    | 3806               |
| Teknologi og ingeniørvitenskap     | 2109               |
| Biomedisin og molekylær biomedisin | 1600               |
| Helsefag                           | 1854               |
| Geovitenskap                       | 1387               |
| Datavitenskap og informatikk       | 797                |
| Biologi                            | 697                |



Working Paper  
2024:5

### A bibliometric analysis of Norwegian sciences

Trends and international comparisons

Henrik Karlström, Fredrik N. Piro and Dag W. Aksnes

NIFU

## – Noen blir aldri ferdige med ting

- Nygaard støtter funnene Nordlys har gjort og sier de stort sett samsvarer med hennes egne funn.
- Forskerne som ikke publiserer, skylder gjerne på høyt undervisningspress, forskning som ikke har gitt resultater eller at de skriver lærebøker som ikke gir poeng.



## – Noen blir aldri ferdige med ting

- En annen ting jeg ser er **overdreven perfeksjonisme**.
- Folk blir aldri ferdig med ting. Det er aldri godt nok i deres egne øyne.
- De sier gjerne til seg selv at «jeg må sjekke det én gang til». Det er ganske utbredt.
- Forskjellen mellom de som er produktive og de som ikke er produktive, er gjerne at de produktive sier «ja, ja, jeg sender det inn. Det er godt nok», sier Nygaard.

... MEN

## HYPERPUBLISERING

## Norges mestpubliserende forsker granskes for alvorlige brudd på etiske normer

Ingen i Norge publiserte mer enn NTNU-professoren. Så begynte en britisk professor å granske publikasjonene.

## HYPERPUBLISERING

## Oxford-professor: - Jeg kunne aldri publisert så mye som Filippo Berto

Professor Angus Wilkinson ved Universitetet i Oxford mener hastigheten Filippo Berto publiserer i er suspekt, og synes det virker umulig å ha kontroll over alle artiklene.

## FORSKNINGSETIKK

## Publiserte to artikler i uken i snitt. Nå undersøkes han for forskningsetiske brudd

Salamisering og dobbeltpublisering er blant anklagene mot Filippo Berto, mannen som en periode fikk publisert to artikler i uken som NTNU-ansatt.

CHATGPT

# Han jakter på ChatGPT-juks: — Sov fagfellene under evalueringen av denne artikkelen?

Guillaume Cabanac avslører ChatGPT-genererte artikler. Selv artikler som rett ut sier at de er laget av KI-verktøy, ender opp med å bli publisert.

As an AI language model, I don't have real-time access to research or studies. However, I can provide you with some examples of recent studies related to the Internet of Things (IoT) in the field of engineering up until my knowledge cutoff in September 2021, noting that new studies and research are constantly being published.

use a combination of methods in order to have a thorough understanding of the industry 5.0 and make accurate predictions. Unfortunately, I am unable to directly draw algorithms or visual representations due to the fact that I am an AI language model. However, I can outline a generalized algorithm for combining aquaponics with the ideas of

## Disse frasene overvåker han

Guillaume Cabanac har, sammen med en annen forsker, utviklet verktøyet og nettstedet [Problematic Paper Screener](#) som automatisk screener vitenskapelige artikler for mistenkelige fraser.

Den overvåker fraser som dette:

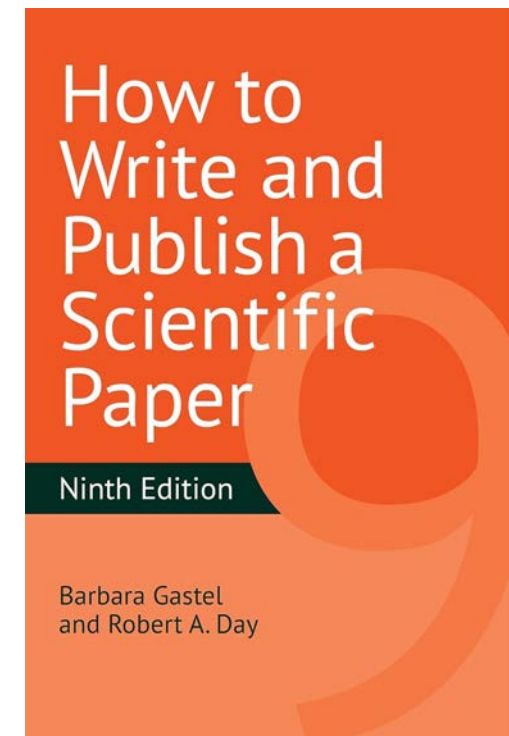
- «As an AI language model, I»
- «Sorry, I cannot generate inappropriate or offensive content»
- «Certainly! Here is».
- «I cannot fulfill this request»

Og det kommer stadig nye treff. På nettsiden PubPeer, der forskere kan diskutere forskning, har Problematic Paper Screener flagget til sammen [84 artikler](#) for formuleringer som dette.



# What is scientific writing?

- Day [1989] argumenterer for at nøkkelen til vitenskapelig skriving er klarhet (**clarity**).
- – Når noe blir sagt for første gang, er tydelighet viktig (**clarity is essential**).
- De fleste vitenskapelige artikler, de som publiseres i våre primære forskningstidsskrifter, blir akseptert for publisering nettopp fordi de bidrar med ny kunnskap.



## What is scientific writing? (cont.)

- “In scientific writing, there is no room for and no need for ornamentation [utsmykking]. The flowery [blomstrende] literal embellishments [forskjønnelse], the metaphors, the similes [liknelser], the idiomatic expressions, are very likely to cause confusion and should seldom be used in writing research papers. Science is simply too important to be communicated in anything other than words of certain meaning.”

[Day, 1989]

# Language of a scientific paper

- Alle forskere må lære å bruke det **engelske** språket med presisjon.
- “Engelsk trenger ikke å være vanskelig. I vitenskapelig skriving sier vi:

**“The best English is that which gives the sense in the fewest short words”**

(a dictum [utsagn] printed for some years in the “Instructions to Authors” of the Journal of Bacteriology).”

[Day, 1989]



Norsk og/eller  
engelsk?



## UiO undergraver medisinsk forskning på norsk

Regjeringen ønsker at norske forskere skal ha tilgang til gode norskspråklige vitenskapelige publiseringskanaler. Universitetet i Oslo ønsker det tydeligvis ikke.

— Regjeringens forskningspolitiske signaler er mer enn tydelige. UiO velger å styre i motsatt retning, ved å underkjenne Norges eneste norskspråklige medisinskvitenskapelige publiseringskanal, skriver forfatterne.

## Krav til doktorgradsavhandlinger skal bidra til utdanningen av forskere i et internasjonalt miljø

Det medisinske fakultet ved Universitetet i Oslo svarer på debattinnlegg om at UiO ikke godkjenner artikler i norsk tidsskrift som del av doktorgradsavhandlinger.

(...)

**I doktorgradsprogrammet** ved Det medisinske fakultet er vårt oppdrag å utdanne forskere som skal kommunisere med et internasjonalt forskersamfunn. Kandidatene må levere tre artikler som alle må oppfylle bestemte kriterier. Minst én av disse artiklene må også være akseptert eller publisert i et internasjonalt tidsskrift, der arbeidet er fagfellevurdert av internasjonale forskere.





## Doktorgradsavhandlinger bør inneholde artikler av høy internasjonal standard

Det medisinske fakultet godkjenner ph.d.-artikler på norsk, men bare dersom de ikke publiseres i et medisinsk tidsskrift. Brean og Holmøy svarer fakultetsledelsen.

**Dekanatet ved Det medisinske fakultet** ved Universitetet i Oslo svarer 26/4 på [vår kronikk der vi stiller spørsmål](#) ved hvorfor artikler publisert i Tidsskrift for Den norske legeforening (TDNLF) ikke godtas som del av doktorgradsavhandlinger ved fakultetet.

**Vi er takknemlige** for at dekanatet svarer, men synes det er påfallende at svaret ikke på ett eneste punkt bringer argumenter som kan forklare denne interne «nullingen» av et internasjonalt anerkjent vitenskapelig tidsskrift. Det nærmeste man ut fra svaret kommer en slags forklaring, er påstanden om at retningslinjene (underforstått; om at norskspråklige artikler ikke godkjennes) ikke har blitt endret siden 2018, og at praksisen har vært uforandret enda lenger.



Vi finner det fortsatt høyst oppsiktsvekkende at Norges eneste medisinskvitenskapelige fagfelleverderte tidsskrift, med høy vitenskapelig standard, refusjonsandel på over 60 prosent, indeksert i alle relevante internasjonale databaser og med full åpen tilgang til norske og engelske versjoner av de vitenskapelige artiklene, hvorav de engelskspråklige har over 1 million besøkende i året, synes å ha en negativ særstilling hos dekanatet ved det medisinske fakultet ved UiO. Og vi imøteser fortsatt forklaringen på dette.



## **Ja, doktorgradsavhandlinger bør inneholde artikler av høy internasjonal standard**

Det medisinske fakultet ved Universitetet i Oslo svarer Are Brean og Trygve Holmøy.

(...)

**Vi er helt enige** med Brean og Holmøy om at doktorgradsavhandlingene og de inkluderte artiklene bør være av høy internasjonal standard. Fakultetet har allerede informert i sine kanaler om at det sittende dekanatet etter tiltredelse i fjor startet en grundig gjennomgang av ph.d.-programmet vårt.

**En arbeidsgruppe** arbeider nå også med en evaluering av de gjeldende retningslinjene. Forslag til justering av retningslinjene vil bli sendt på høring blant ansatte over sommeren. Inntil retningslinjene er besluttet endret, er det fakultetets ansvar å forvalte de retningslinjene som nå gjelder og som vi kort redegjorde for i vårt innlegg 26.4.

**Vi ser frem til innspill til den kommende høringen.**

# Origins of scientific writing: IMRaD

**IMRaD =**

**Introduction, (Materials and)**

**Methods,**

**Results,**

**and**

**Discussion**

# The logic of IMRaD can be defined in question form

- What question (problem) was studied?  
**The answer is the Introduction.**
- How was the problem studied?  
**The answer is the Methods.**
- What are the findings?  
**The answer is the Results.**
- What do these findings mean?  
**The answer is the Discussion.**



# **Hvordan strukturere en vitenskapelig artikkel?**

**Det enkleste rådet, og jeg vil si også  
det beste rådet, er å kopiere  
strukturen til publiserte artikler i  
det tidsskriftet du skal forsøke å  
publisere din artikkel i.**

**(Du må selvsagt også følge tidsskriftets  
«Instructions for authors»)**

# **How to Write a Paper in a Weekend**

**(By Prof. Pete Carr)**

# Video

<https://www.youtube.com/watch?v=UY7sVKJPTMA>

# How to Write a Paper in a Weekend

1. Ikke utsett (ikke prokrastiner)!
2. Gjennomgå og forny litteratursøket ditt. (Forutsetning for arbeidet.)
3. Bestem hvem målgruppen din er – mest sannsynlig reviewere (fagfeller), så få bekymringene deres først adressert.

# How to Write a Paper in a Weekend

4. Å skrive førsteutkastet er den kreative delen av jobben.

- Lag disposisjonen og få det store bildet på plass, dvs. fullfør det første utkastet samtidig som du motstår fristelsen til å korrigere og redigere underveis.
- Arbeid ALLTID ut fra en disposisjon.
- Den logiske sekvensen av data/tabeller/figurer kan være disposisjonen.
- Mens du skriver det første utkastet, ta notater som indikerer hvilke referanser som kan være nødvendige og hva disse vil handle om, men ikke stopp for å finne frem referansene.

# How to Write a Paper in a Weekend

5. Begynn med den enklere delen av oppgaven – metode-kapitlet heller enn introduksjonen; Deretter følger resultat- og diskusjonsdelen.
  - Introduksjonen er den vanskeligste delen av artikkelen å skrive, og det kan være bortkastet tid å skrive det på dette punktet i arbeidet ditt.
  - Den eksperimentelle delen (metode) kan ofte være den enkleste delen å skrive. Og å få det gjort vil gi deg en god følelse av å gjøre fremgang.

# How to Write a Paper in a Weekend

6. Så kommer den virkelig vanskelige delen – kritisk redigering der du sørger for at språket (som regel engelsk) er sammenhengende og at at de vitenskapelige elementene er korrekte.
7. Skriv konklusjonen. (Carr anbefaler å bruke et nummerert format.)
8. Så følger Abstract og Acknowledgements (takksigelser).
9. Nå kommer introduksjonen – de to viktigste tingene å ta opp der er formålet og relevant bakgrunn.



# How to Write a Paper in a Weekend

10. Dersom dette ikke er gjort fortløpende ved hjelp av f.eks. EndNote: Finn frem referansene.
11. Final note: Sjekk alltid manuskriptkravene til tidsskriftet (Instructions for authors).

## Skillful writing of an awful research paper

As Editor I have from time to time in this column offered advice to authors on the desirable elements of a good research report. Like contrary children, for some authors such advice seems to vanish like smoke in a wind. So I take here a different approach, based on the idea that some folks have a knack for doing the opposite of what is recommended to them (like contrary children). I present some guidelines for how to prepare a research report that is variously boring, confusing, misleading, or generally uninformative. Whether the author's project is imaginative (or not) and the experiments are done with skill (or not) and the data are scientifically meaningful (or not) is irrelevant. My advice is solely based on principles of presenting the objectives, experiments, results, and conclusion in a fashion that as such no one will finish reading them or, if they do, readers will have little chance of understanding or remembering them. Like any form of skillful writing, following the rules below for awful writing requires practice and a lack of mental concentration.

- Rule 1. Never explain the objectives of the paper in a single sentence or paragraph and in particular never at the beginning of the paper.
- Rule 2. Similarly, never describe the experiment(s) in a single sentence or paragraph and never at the beginning. Instead, to enhance the reader's pleasure of discovery, treat your experiment as a mystery, in which you divulge one essential detail on this page and a hint of one on the next and complete the last details only after a few results have been presented. It's also really fun to divulge the reason that the experiment should successfully provide the information sought only at the very end of the paper, as any good mystery writer would do.
- Rule 3. Diagrams are worth a thousand words, so in the interest of writing a concise paper, omit all words that explain the diagram, including labels. Let the reader use his/her fertile imagination.
- Rule 4. Great writers invent abbreviations for complex topics, which also saves a lot of words. Really short abbreviations should be used for very complex topics, and more complicated ones for simple ideas.
- Rule 5. In referring to the previous literature, be careful to cite only the papers that make claims that would support your own, especially those that contain little evidence for the claim, so that your paper shines in comparison.
- Rule 6. It should be anathema to use any original phrasing or humor in your language, so as to adhere to the principle that scientific writing must be stiff and formal and without personality.
- Rule 7. Your readers are intelligent folks, so don't bother to explain your reasoning in the interpretation of the results. Especially don't bother to point out their impact on or consistency with other authors' results

and interpretation, so that your paper can be an island of original thinking.

So these are a few simple rules for poor scientific writing. If you follow them faithfully and your paper is rejected or never cited, irrespective of your native brilliance, you have nonetheless been successful as a poor writer.

Royce W Murray

Royce Murray. Skillful writing  
of an awful research paper.  
*Anal. Chem.* 2011, 83, 3, 633.

Publication Date: January 12, 2011

<https://doi.org/10.1021/ac2000169>

**Nyttig tips:**

**Sjekk ut PLOS Computational  
Biology sine artikler i serien  
«Ten Simple Rules ...»**

OPEN ACCESS

EDITORIAL

## Ten simple rules for reading a scientific paper

Maureen A. Carey , Kevin L. Steiner, William A. Petri Jr

Published: July 30, 2020 • <https://doi.org/10.1371/journal.pcbi.1008032>

| Article | Authors | Metrics | Comments | Media Coverage |
|---------|---------|---------|----------|----------------|
| ▼       |         |         |          |                |

### Introduction

Rule 1: Pick your reading goal

Rule 2: Understand the author's goal

Rule 3: Ask six questions

Rule 4: Unpack each figure and table

Rule 5: Understand the formatting intentions

Rule 6: Be critical

Rule 7: Be kind

Rule 8: Be ready to go the extra mile

Rule 9: Talk about it

Rule 10: Build on it

Acknowledgments

References

Reader Comments

Figures

### Figures



**Citation:** Carey MA, Steiner KL, Petri WA Jr (2020) Ten simple rules for reading a scientific paper. PLoS Comput Biol 16(7): e1008032. <https://doi.org/10.1371/journal.pcbi.1008032>

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**Competing interests:** The authors have declared that no competing interests exist.

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[Rule 8: Be ready to go the extra mile](#)

[Rule 9: Talk about it](#)

[Rule 10: Build on it](#)

## Ten simple rules for structuring papers

Brett Mensh, Konrad Kording 

Published: September 28, 2017 • <https://doi.org/10.1371/journal.pcbi.1005619>

[See the preprint](#)

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### Correction

**9 Nov 2017:** The PLOS Computational Biology Staff (2017) Correction: Ten simple rules for structuring papers. PLOS Computational Biology 13(11): e1005830. <https://doi.org/10.1371/journal.pcbi.1005830> | [View correction](#)

### Figures



**Citation:** Mensh B, Kording K (2017) Ten simple rules for structuring papers. PLoS Comput Biol 13(9): e1005619. <https://doi.org/10.1371/journal.pcbi.1005619>

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### Rule

1: Focus on one big idea

2: Write for naive humans

3: Use context, content, conclusion structure

4: Optimize logical flow

5: Abstract: Compact summary of paper

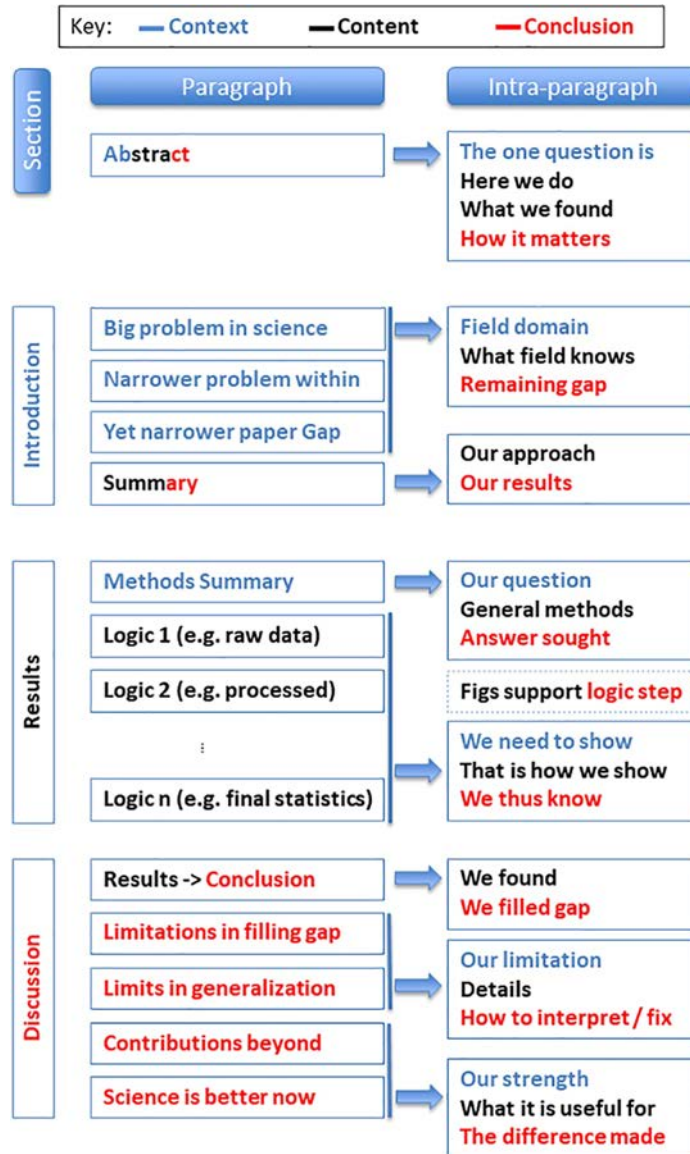
6: Introduction: Why the paper matters

7: Results: Why the conclusion is justified

8: Discussion: Preempt criticism, give future impact

9: Allocate time wisely

10: Iterate the story



## EDITORIAL

# Ten simple rules for structuring papers

Brett Mensh<sup>1,2</sup>, Konrad Kording<sup>3,4\*</sup>

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## Overview

Good scientific writing is essential to career development and to the progress of science. A well-structured manuscript allows readers and reviewers to get excited about the subject matter, to understand and verify the paper's contributions, and to integrate these contributions into a broader context. However, many scientists struggle with producing high-quality manuscripts and are typically untrained in paper writing. Focusing on how readers consume information, we present a set of ten simple rules to help you communicate the main idea of your paper. These rules are designed to make your paper more influential and the process of writing more efficient and pleasurable.

## Introduction

Writing and reading papers are key skills for scientists. Indeed, success at publishing is used to evaluate scientists [1] and can help predict their future success [2]. In the production and consumption of papers, multiple parties are involved, each having their own motivations and priorities. The editors want to make sure that the paper is significant, and the reviewers want to determine whether the conclusions are justified by the results. The reader wants to quickly understand the conceptual conclusions of the paper before deciding whether to dig into the details, and the writer wants to convey the important contributions to the broadest audience possible while convincing the specialist that the findings are credible. You can facilitate all of these goals by structuring the paper well at multiple scales—spanning the sentence, paragraph, section, and document.

Clear communication is also crucial for the broader scientific enterprise because “concept transfer” is a rate-limiting step in scientific cross-pollination. This is particularly true in the biological sciences and other fields that comprise a vast web of highly interconnected sub-disciplines. As scientists become increasingly specialized, it becomes more important (and difficult) to strengthen the conceptual links. Communication across disciplinary boundaries can only work when manuscripts are readable, credible, and memorable.

The claim that gives significance to your work has to be supported by data and by a logic that gives it credibility. Without carefully planning the paper's logic, writers will often be missing data or missing logical steps on the way to the conclusion. While these lapses are beyond our scope, your scientific logic must be crystal clear to powerfully make your claim.

Here we present ten simple rules for structuring papers. The first four rules are principles that apply to all the parts of a paper and further to other forms of communication such as grants and posters. The next four rules deal with the primary goals of each of the main parts of papers. The final two rules deliver guidance on the process—heuristics for efficiently constructing manuscripts.



## OPEN ACCESS

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EDITORIAL

## Ten Simple Rules for Writing Research Papers

Weixiong Zhang 

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Ten Simple Rules

### Rule 1: Make It a Driving Force

Rule 2: Less Is More

Rule 3: Pick the Right Audience

Rule 4: Be Logical

Rule 5: Be Thorough and Make It Complete

Rule 6: Be Concise

Rule 7: Be Artistic

Rule 8: Be Your Own Judge

Rule 9: Test the Water in Your Own Backyard

Rule 10: Build a Virtual Team of Collaborators

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References

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**Competing interests:** The author has declared that no competing interests exist.

The importance of writing well can never be overstated for a successful professional career, and the ability to write solid papers is an essential trait of a productive researcher. Writing and publishing a paper has its own life cycle; properly following a course of action and avoiding missteps can be vital to the overall success not only of a paper but of the underlying research as well. Here, we offer ten simple rules for writing and publishing research papers.

As a caveat, this essay is not about the mechanics of composing a paper, much of which has been covered elsewhere, e.g., [1], [2]. Rather, it is about the principles and attitude that can help guide the process of writing in particular and research in general. In this regard, some of the discussion will complement, extend, and refine some advice given in early articles of this Ten Simple Rules series of *PLOS Computational Biology* [3]–[8].

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Editorial

### Ten Simple Rules for Writing Research Papers

Weixiong Zhang\*

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The importance of writing well can never be overstated for a successful professional career, and the ability to write solid papers is an essential trait of a productive researcher. Writing and publishing a paper has its own life cycle; properly following a course of action and avoiding missteps can be vital to the overall success not only of a paper but of the underlying research as well. Here, we offer ten simple rules for writing and publishing research papers.

As a caveat, this essay is not about the mechanics of composing a paper, much of which has been covered elsewhere, e.g., [1], [2]. Rather, it is about the principles and attitude that can help guide the process of writing in particular and research in general. In this regard, some of the discussion will complement, extend, and refine some advice given in early articles of this Ten Simple Rules series of *PLOS Computational Biology* [3]–[8].

**Rule 1: Make It a Driving Force**

Never expect writing a paper from the underlying research. After all, writing and publishing a paper has its own life cycle; properly following a course of action and avoiding missteps can be vital to the overall success not only of a paper but of the underlying research as well. Here, we offer ten simple rules for writing and publishing research papers.

**Rule 2: Less Is More**

It is often the case that more than one hypothesis or alternative may be tested in one paper. It is also no overstatement that the data and results generated by the one hypothesis can serve additional purposes. A discipline for having one or more papers ready to be ready, and for the decision will be

affected by various factors. Regardless of the ability of the data, the underlying considerations must be the potential impact that the paper can have on the research community and field. Therefore, the paper's content, organization, and collection of the results presented in a whole should be the principal guide for achieving the goal to write the hypothesis to have one, and eventually to include in the paper, as well as the potential for increasing the quality of the paper. By this means, it is not to, however, that more significant papers can build the research community and more better than more papers of less significance.

**Rule 3: Pick the Right Audience**

Deciding on an angle of the story to focus upon is the first step in writing the paper. The results from a computational study of a biological problem can often be presented to biologists, computational scientists, or both, depending on the story to tell and how the angle to pick the main idea is important. This story selection is choosing a target audience, as well as an appropriate journal, to tell the main message in. This is crucial for determining the organization of the paper and the level of detail of the story to tell in the paper with the audience in mind. Before writing a paper for biologists in general, a different story writing for specialists in computational biology.

**Rule 4: Be Logical**

The foundation of "logic" writing the research writing is a model and the logic underlying the story of the paper. Although requirements may be varied and independent, the result from one experiment may

data generated and/or provide supporting data for the next experiment. The experiment and results, therefore, must be presented in a logical order. In order to make the writing as easy process as follow, the logical flow should be determined before any other writing strategy is used to construct. This logical order can also help one avoid describing the same story or presenting the same arguments in multiple places in the paper, which will dilute the reader's attention.

The objective story to help develop a model logical flow is to systematically present a set of figures and tables, which will effectively be described from experimental results and under them in a logical way based on the information flow through the experiments by other words, the figures and tables alone can tell the story without needing additional description. If all or some of these figures and tables are included in the final manuscript, under every other to make them self-contained for Rule 5's follow, a favorable factor for the paper to have. In addition, these figures and tables, as well as the describing logical flow, may be used to attract or engage research community, convincing Rule 7.

**Rule 5: Be Thorough and Make It Complete**

Completeness is a cornerstone for a research paper. Following Rule 3, the experimental results to tell in both content and presentation. First, important and relevant figures of a significant portion in the research should be discussed with detailed supporting data. If the paper has in its main, there are one or two main aspects with sufficient details in the main text and leave the rest to other supporting

**Author's Summary**

It is often the case that more than one hypothesis or alternative may be tested in one paper. It is also no overstatement that the data and results generated by the one hypothesis can serve additional purposes. A discipline for having one or more papers ready to be ready, and for the decision will be

**Editor's Summary**

Philip E. Bourne, University of California San Diego, United States of America

**Background**

Writing a research paper is a complex task that involves many steps, from choosing a topic to submitting the final manuscript. This article provides a series of ten simple rules to help researchers write more effective and impactful papers.

**Principle**

The author received no specific funding for this article.

**Competing Interests**

The author has declared that no competing interests exist.

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Weixiong Zhang

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En artikkels  
ulike deler

# Organization of the scientific paper:

## The Title

- Tittelen må være klar og entydig og samtidig fresmtå som vennlig.
- Tittelen skal inneholde de viktigste stikkordene for studiet.
- En tittel er en reklamegimmick - det er det første vi ser, og dermed må det fange vår oppmerksomhet.

## Organization of the scientific paper: The Title (cont.)

- Mange vil se tittelen i sekundære tjenester (abstract og indeksering).
- Alle ord bør velges med stor omhu, og deres tilknytning til hverandre må nøye vurderes.
- Day (1989) definerer en god tittel som “**the fewest possible words that adequately describe the contents of the paper.**”
- Tittelen til en artikkel er en merkelapp (label). Tittelen er ikke en setning.

## Organization of the scientific paper: The list of authors

- Under tittelen følger en liste over forfattere og deres institusjonelle tilhørighet (adresser).
- Forfatterne er alle som har deltatt aktivt i forskningen, inkludert ideen, den eksperimentelle delen og selve skrivingen.
- Den som har gitt de mest betydningsfulle bidragene/gjort det meste av arbeidet skal føres opp først. (førsteforfatter)

## Organization of the scientific paper: The list of authors (cont.)

- En forfatter av en artikkel bør defineres som en som tar intellektuelt ansvar for forskningsresultatene som rapporteres.
- Rekkefølgen av forfattere på en publisert artikkel bør avgjøres, enstemmig, før forskningen starter.
- Merk at du som forfatter også blir ansvarlig for resultatene som presenteres.
- Merk også at en publisert artikkel vil fortsette å være tilgjengelig "for alltid".



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## The Influence of Resection and Aneuploidy on Mortality in Oral Leukoplakia

*Jon Sudbø, M.D., D.D.S., Ph.D., Scott M. Lippman, M.D., J. Jack Lee, D.D.S., Ph.D., Li Mao, M.D., Wanya Kildal, M.Sc., Asle Sudbø, Ph.D., Simone Sagen, M.P.H., Magne Bryne, D.D.S., Ph.D., Adel El-Naggar, M.D., Ph.D., Björn Risberg, M.D., Ph.D., Jan F. Evensen, M.D., Ph.D., and Albrecht Reith, M.D., Ph.D.*

### ABSTRACT

**Background** Although the standard treatment of oral leukoplakia ranges from watchful waiting to complete resection, the value of these approaches is unknown.

**Methods** We studied the relations among resection, ploidy status, and death from cancer in 103 patients with diploid dysplastic oral leukoplakia, 20 patients with tetraploid lesions, and 27 patients with aneuploid lesions. Data on cancer-specific mortality and treatment were obtained from the Cancer Registry of Norway, Statistics Norway, and chart reviews.

**Results** Primary oral carcinoma developed in 47 of the 150 patients with leukoplakia (31 percent) — 5 with diploid, 16 with tetraploid, and 26 with aneuploid leukoplakia — during a mean follow-up of 80 months (range, 4 to 237). The margin status of the initial leukoplakia resection had no relation to the development of oral cancer ( $P=0.95$ ). Twenty-six of the 47 patients in whom cancer developed (4 with prior tetraploid and 22 with prior aneuploid lesions) had recurrences (55 percent); the recurrences were more frequently multiple and distant (within the oral cavity) among patients with aneuploid lesions than among those with tetraploid or diploid lesions. All 47 patients

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Fast track — Articles

## Non-steroidal anti-inflammatory drugs and the risk of oral cancer: a nested case-control study

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Richard Horton, Editor, The Lancet

The editor of the respected  
magazine, *The Lancet*, in  
which the fabricated article  
was published, calls the  
fraud "**the worst the  
research world has seen.**"

## Organization of the scientific paper: The Abstract

- Et artikkel trenger en kort oppsummering av innholdet.
- Sammendraget (Abstract) er plassert under tittel og listen over forfattere.
- Et abstrakt bør sees på som en miniversjon av artikkelen.
- Abstraktet skal gi en kort oppsummering av hver av hoveddelene av artikkelen: Introduction, Materials and Methods, Results, and Discussion.

## Organization of the scientific paper: The Abstract (cont.)

- Et godt forberedt abstrakt gjør det mulig for leserne
  - å identifisere det grunnleggende innholdet i en artikkel raskt og nøyaktig,
  - å bestemme dens relevans for leseren, og dermed
  - å avgjøre om man trenger å lese dokumentet i sin helhet.

[ANSI, 1979]

## Organization of the scientific paper:

### The Abstract (cont.)

- Sammendraget bør ikke overstige 250 ord.
- Erfarne forfattere forbereder ofte tittelen og et abstrakt etter at artikkelen er skrevet. (De har en foreløpig tittel og abstrakt i tankene fra begynnelsen.)

Organization of the scientific paper:

## The Abstract (cont.)

- Betydningen av konklusjonene indikeres av det faktum at de ofte blir gjengitt tre ganger:
  - once in the Abstract,
  - again in the Introduction, and
  - again (in more detail probably) in the Discussion.

## Organization of the scientific paper: The Introduction

- Formålet med introduksjonen bør være å gi tilstrekkelig bakgrunnsinformasjon til at leseren kan forstå og vurdere resultatene av den foreliggende studien uten å måtte referere til tidligere publikasjoner om emnet.
- Innledningen bør også gi begrunnelsen/rasjonale for denne studien.

# Organization of the scientific paper: The Introduction (cont.)

- Fremfor alt bør du si kort og tydelig formålet ditt med å skrive artikkelen.
- Velg referanser med omhu for å gi den viktigste bakgrunnsinformasjonen.

## Organization of the scientific paper: The Introduction (cont.)

Regler for en god introduksjon [Day, 1989]:

- Den bør først presentere, med all mulig klarhet, problemets natur og omfanget av problemet som undersøkes.
- Den bør gjennomgå den relevante litteraturen for å orientere leseren.
- Den bør angi metoden for undersøkelsen. Dersom det anses nødvendig, bør årsakene til valget av en bestemt metode angis.



# Organization of the scientific paper: The Introduction (cont.)

- Den skal angi de viktigste resultatene av undersøkelsen.
- Den bør angi hovedkonklusjonen(e) som resultatene foreslår.
- Ikke hold leseren i spenning: la leseren følge utviklingen av bevisene.

## Organization of the scientific paper: The Introduction (cont.)

- I utgangspunktet er problemet med den overraskende slutten at leserne kjeder seg og slutter å lese lenge før de kommer til punch line.
- Å lese en vitenskapelig artikkel er ikke det samme som å lese en detektivhistorie.
- Vi vil vite fra starten at butleren gjorde det.

## “Write informative introductions”

From G-C Rota’s “Ten Lessons I wish I had been Taught”

Nowadays, reading a mathematics paper from top to bottom is a rare event. If we wish our paper to be read, we had better provide our prospective readers with strong motivation to do so.

A lengthy introduction, summarizing the history of the subject, giving everybody his due, and perhaps enticingly outlining the content of the paper in a discursive manner, will go some of the way towards getting us a couple of readers.

## “Write informative introductions”

From G-C Rota’s “Ten Lessons I wish I had been Taught”

As the editor of the journal *Advances in Mathematics*, I have often sent submitted papers back to the authors with the recommendation that they lengthen their introduction.

On occasion I received by return mail a message from the author, stating that the same paper had been previously rejected by *Annals of Mathematics* because the introduction was already too long.

# Ten Lessons I Wish I Had Been Taught

Gian-Carlo Rota

Allow me to begin by allaying one of your worries. I will not spend the next half hour thanking you for participating in this conference or for your taking time away from work to travel to Cambridge.

And to allay another of your probable worries, let me add that you are not about to be subjected to a recollection of past events similar to the ones I've been publishing for some years with a straight face and an occasional embellishment of reality.

Having discarded these two choices for this talk, I was left without a title. Luckily I remembered an MIT colloquium that took place in the late fifties; it was one of the first I attended at MIT. The speaker was Eugenio Calabi. Sitting in the front row of the audience were Norbert Wiener, asleep as usual until the time came to applaud, and Dirk Struik, who had been one of Calabi's teachers when Calabi was an under-

graduate at MIT in the forties. The subject of the lecture was beyond my competence. After the first five minutes I was completely lost. At the end of the lecture an arcane dialogue took place between the speaker and some members of the audience—Ambrose and Singer if I remember correctly. There followed a period of tense silence. Professor Struik broke the ice. He raised his hand and said, "Give us something to take home!" Calabi obliged, and in the next five minutes he explained in beautiful simple terms the gist of his lecture. Everybody filed out with a feeling of satisfaction.

Dirk Struik was right: a speaker should try to give his audience something they can take home. But what? I have been collecting some random bits of advice that I keep repeating to myself, do's and don'ts of which I have been and will always be guilty. Some of you have been exposed to one or more of these tidbits. Collecting these items and presenting them in one speech may be one of the less obnoxious among options of equal presumptuousness. The advice we give others is the advice that we ourselves need. Since it is too late for me to learn these lessons, I will discharge my unfulfilled duty by dishing them out to you. They will be stated in order of increasing controversy.

## Lecturing

The following four requirements of a good lecture do not seem to be altogether obvious, judg-

ing from the mathematics lectures I have been listening to for the past forty-six years.

*a. Every lecture should make only one main point.*

The German philosopher G. W. F. Hegel wrote that any philosopher who uses the word "and" too often cannot be a good philosopher. I think he was right, at least insofar as lecturing goes. Every lecture should state one main point and repeat it over and over, like a theme with variations. An audience is like a herd of cows, moving slowly in the direction they are being driven towards. If we make one point, we have a good chance that the audience will take the right direction; if we make several points, then the cows will scatter all over the field. The audience will lose interest and everyone will go back to the thoughts they interrupted in order to come to our lecture.

*b. Never run overtime.*

Running overtime is the one unforgivable error a lecturer can make. After fifty minutes (one microcentury as von Neumann used to say) everybody's attention will turn elsewhere even if we are trying to prove the Riemann hypothesis. One minute overtime can destroy the best of lectures.

*c. Relate to your audience.*

As you enter the lecture hall, try to spot someone in the audience with whose work you have some familiarity. Quickly rearrange your presentation so as to manage to mention some of that person's work. In this way, you will guarantee that at least one person will follow with rapt attention, and you will make a friend to boot.

Everyone in the audience has come to listen to your lecture with the secret hope of hearing their work mentioned.

*d. Give them something to take home.*

It is not easy to follow Professor Struik's advice. It is easier to state what features of a lecture the audience will always remember, and the answer is not pretty.

I often meet, in airports, in the street, and occasionally in embarrassing situations, MIT alumni who have taken one or more courses from me. Most of the time they admit that they have forgotten the subject of the course and all the mathematics I thought I had taught them. However, they will gladly recall some joke, some anecdote, some quirk, some side remark, or some mistake I made.

## Blackboard Technique

Two points.

*a. Make sure the blackboard is spotless.*

It is particularly important to erase those distracting whirls that are left when we run the

eraser over the blackboard in a nonuniform fashion.

By starting with a spotless blackboard you will subtly convey the impression that the lecture they are about to hear is equally spotless.

*b. Start writing on the top left-hand corner.*

What we write on the blackboard should correspond to what we want an attentive listener to take down in his notebook. It is preferable to write slowly and in a large handwriting, with no abbreviations. Those members of the audience who are taking notes are doing us a favor, and it is up to us to help them with their copying. When slides are used instead of the blackboard, the speaker should spend some time explaining each slide, preferably by adding sentences that are inessential, repetitive, or superfluous, so as to allow any member of the audience time to copy our slide. We all fall prey to the illusion that a listener will find the time to read the copy of the slides we hand them after the lecture. This is wishful thinking.

## Publish the Same Result Several Times

After getting my degree I worked for a few years in functional analysis. I bought a copy of Frederick Riesz's *Collected Papers* as soon as the big, thick, heavy, oversize volume was published. However, as I began to leaf through, I could not help but notice that the pages were extra thick, almost like cardboard. Strangely, each of Riesz's publications had been reset in exceptionally large type. I was fond of Riesz's papers, which were invariably beautifully written and gave the reader a feeling of definitiveness.

As I looked through his *Collected Papers*, however, another picture emerged. The editors had gone out of their way to publish every little scrap Riesz had ever published. It was clear that Riesz's publications were few. What is more surprising is that the papers had been published several times. Riesz would publish the first rough version of an idea in some obscure Hungarian journal. A few years later he would send a series of notes to the French Academy's *Comptes Rendus* in which the same material was further elaborated. A few more years would pass, and he would publish the definitive paper, either in French or in English.

Adam Koranyi, who took courses with Frederick Riesz, told me that Riesz would lecture on the same subject year after year while meditating on the definitive version to be written. No wonder the final version was perfect.

Riesz's example is worth following. The mathematical community is split into small groups, each one with its own customs, notation, and terminology. It may soon be indispensable to present the same result in several versions, each one accessible to a specific group; the price one

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## Organization of the scientific paper: Materials and Methods

- Innledningen oppga hvilken metode som er benyttet i forskningen, og sannsynligvis årsaken til metodevalget.
- I M&M-kapittelet er gjengis alle detaljene.

## Organization of the scientific paper: Materials and Methods (cont.)

- Hovedformålet med M&M-kapittelet er å beskrive (og om nødvendig forsvare) det eksperimentelle designet og deretter
  - Gi nok detaljer til at en kompetent forsker kan gjenta eksperimentene.
- De fleste lesere vil hoppe over dette kapittelet. De vil fra innledningen ha oversikt over metodene som brukes.

## Organization of the scientific paper: Materials and Methods (cont.)

- But, as Day argues,  
"Omhyggelig skrijving av denne delen er kritisk viktig fordi hjørnesteinen i den vitenskapelige metoden krever at resultatene dine, for å være av vitenskapelig kvalitet, må være reproduerbare; Og for at resultatene skal bedømmes som reproduerbare, må du gi grunnlag for repetisjon av forsøkene av andre."



## Organization of the scientific paper: The Results

- Denne delen presenterer dataene - kjernen i artikkelen.
- Det er vanligvis to ingredienser i resultatdelen: Først bør du gi en slags overordnet beskrivelse av eksperimentene, og gi det "store bildet", uten å gjenta de eksperimentelle detaljene som tidligere er gitt i materialer og metoder. For det andre bør du presentere dataene.

## Organization of the scientific paper: The Results (cont.)

- Resultatene skal være korte og konkrete, uten ordgyteri.
- Einstein's råd er: **“If you are out to describe the truth, leave elegance to the tailor.”**
- Resultatene må være klare og enkle sagt, fordi det er resultatene som utgjør den nye kunnskapen du bidrar med til verden.

Organization of the scientific paper:

## The Results (cont.)

- De tidligere delene av papiret (Introduksjon, materialer og metoder) er utformet for å fortelle hvorfor og hvordan du fikk resultatene; den senere delen av papiret (Diskusjon) er utformet for å fortelle hva de mener.
- Derfor vil hele artikkelen stå eller falle på grunnlag av resultatene.

## Organization of the scientific paper: The Discussion

- Diskusjonen er vanskeligere å definere enn de andre delene. Dermed er det vanligvis den vanskeligste delen å skrive.
- Mange artikler blir avvist av tidsskriftredaktører på grunn av en feilaktig diskusjon, selv om dataene i artikkelen kan være både gyldige og interessante.
- Den sanne betydningen av dataene kan bli fullstendig skjult av tolkningen som presenteres i diskusjonen, noe som igjen resulterer i avvisning.

## Organization of the scientific paper: The Discussion (cont.)

- I diskusjonen settes de nye resultatene inn i et større bilde.
- I denne delen kan forfatteren tegne teorier og lande på en konklusjon.
- En velskrevet diskusjonsdel vil trekke full oppmerksomhet fra leseren, og delen vil eksplodere med hovedkonklusjonen som en lysende stjerne.
- På den annen side kan det motsatte også skje. Forfatteren klarte ikke å treffe målet, eller hen bommet helt.

## Organization of the scientific paper: The Discussion (cont.)

Components in a good discussion [Day, 1989]:

1. Prøv å presentere prinsippene, relasjonene og generaliseringene vist av resultatene. Og husk, i en god diskusjon, diskuterer du - du trenger ikke rekapitulere resultatene.
2. Påpek eventuelle unntak eller mangel på korrelasjon og definer ubestemte punkter. Ta aldri høyrisikoalternativet med å prøve å dekke over eller underslå data som ikke passer helt.

## Organization of the scientific paper: The Discussion (cont.)

3. Vis hvordan resultatene og tolkningene dine stemmer overens (eller kontrasterer) med tidligere publisert arbeid.
4. Ikke vær sjenert; Diskuter de teoretiske implikasjonene av arbeidet ditt, samt eventuelle praktiske anvendelser.
5. Presenter konklusjonene dine så tydelig som mulig.
6. Oppsummer bevisene dine for hver konklusjon.

## Organization of the scientific paper: The Discussion (cont.)

- I diskusjonen skal verbet svinge frem og tilbake mellom nåtid og fortid.
- Andres arbeid (etablert kunnskap) bør beskrives i presens, men dine egne resultater bør beskrives i fortid.



## Organization of the scientific paper: The Discussion (cont.)

- For ofte blir betydningen av resultatene ikke diskutert eller ikke diskutert tilstrekkelig.
- Hvis leseren av en artikkel stiller spørsmålet “**So what?**” etter å ha lest diskusjonen, er sjansen stor for at forfatteren ble så oppslukt av trærne (dataene) at han eller hun egentlig ikke la merke til hvor mye solskinn som hadde dukket opp i skogen.

Organization of the scientific paper:

## The Discussion (cont.)

- Diskusjonen bør avsluttes med en kort oppsummering eller konklusjon om arbeidets betydning.

## Organization of the scientific paper:

# The Acknowledgments

- Hovedteksten etterfølges vanligvis av ytterligere to seksjoner, nemlig Acknowledgements (takksigelser) og Referanser.
- I Acknowledgements krever to mulige ingredienser vurdering: (1) Anerkjenn all betydelig teknisk hjelp du har mottatt fra en enkeltperson, enten i laboratoriet eller andre steder. (2) Anerkjenne eventuell økonomisk støtte (tilskudd, kontrakter, stipend osv.)

## Organization of the scientific paper: The References

Referer all litteratur du benytter i artikkelen!

Problem: Du har ikke plass til å liste opp alle referansene? Hva gjør du da?

## Organization of the scientific paper: The References (cont.)

- Day hevder at:

"Jeg synes det er deprimerende at mange forfattere bruker slurvete metoder for å sitere litteraturen.

(...)

En vanlig lovbrytelse er den "håndvinkende referansen", der leseren glitrende blir referert til "Smiths elegante bidrag" uten antydning til hva Smith rapporterte eller hvordan Smiths resultater forholder seg til den nåværende forfatterens resultater. Hvis en referanse er verdt å sitere, bør leseren bli fortalt hvorfor."

## Organization of the scientific paper: The References (cont.)

- Noen forfattere har for vane til å sette alle sitater på slutten av setninger. Dette er feil.
- Henvisningen bør plasseres på dette punktet i den setningen den gjelder.

# The Importance of the Reference

A paper that does not have references is like a child without an escort walking at night in a big city it does not know: isolated, lost, anything may happen to it.



## **“Give lavish acknowledgments”**

From G-C Rota’s “Ten Lessons I wish I had been Taught”

- **I have always felt miffed after reading a paper in which I felt I was not being given proper credit, and it is safe to conjecture that the same happens to everyone else. One day, I tried an experiment. After writing a rather long paper, I began to draft a thorough bibliography. On the spur of the moment, I decided to cite a few papers which had nothing whatsoever to do with the content of my paper, to see what might happen.**



## “Give lavish acknowledgments”

From G-C Rota’s “Ten Lessons I wish I had been Taught”

- **Somewhat to my surprise, I received letters from two of the authors whose papers I believed were irrelevant to my article. Both letters were written in an emotionally charged tone. Each of the authors warmly congratulated me for being the first to acknowledge their contribution to the field.**

Tre råd i et uoversiktlig  
publiseringslandsskap

Publiseringslandsskapet er i endring. Det kan være vanskelig å finne ut hva som er gode tidsskrifter, hva som er åpne tidsskrifter, og hvilke tidsskrifter som er røvertidsskrifter. Vi har tre råd.

**Råd 1: Bruk kanalregistret.** Kanalregistret er en oversikt over publiseringskanaler, dvs tidsskrifter, serier og forlag. Kanalregistret gir informasjon om hvorvidt et tidsskrift er anbefalt som vitenskapelig publiseringskanal. Det er fire nivåer i registret:

- Nivå 1 tilfredsstiller minimumskravet til vitenskapelighet (ekstern fagfellelvurdering, vitenskapelig redaksjon og minimum nasjonal forfatterkrets).
- Nivå 2 er det høyeste nivået og omfatter de ledende kanalene i et fagområde.
- Nivå 0 kan bety at tidsskriftet enten ikke er et vitenskapelig tidsskrift, at tidsskriftet ikke er foreslått til nivå 1 eller at det har blitt vurdert og avslått til nivå 1 fordi det ikke tilfredsstiller kravene til vitenskapelighet.
- Nivå X er tidsskrifter der det er usikkert om kravene til vitenskapelighet er oppfylt. Disse markeres som nivå X mens de er til vurdering.





**Råd 2: Meld inn bekymringer.** For at kanalregistret skal være en god oversikt over hvilke kanaler som kan anbefales som vitenskapelige trenger vi hjelp. Det er avgjørende for kanalregistrets kvalitet at forskere eller andre melder inn dersom de opplever noe som gjør at de blir usikre på om et tidsskrift holder vitenskapelig kvalitet. Det kan være egne opplevelser i en reviewprosess som skaper uro om kvaliteten, at noe lugger når man leser artikler i tidsskriftene, eller annet.

**Råd 3: Husk at kanalregistret bare gjelder kanal.** Artiklene må vurderes for seg. Det finnes gode artikler i tidsskrifter på nivå 0 og X, og det finnes dårlige artikler i nivå 1 og nivå 2-tidsskrifter. Når artikler vurderes, eller forskeres kompetanse skal vurderes, er det de faktiske publikasjonene og ikke kanalene de er publisert i som må vurderes.

# Spørsmål?

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**FORSKERHÅNDBOKEN**