

# Writing (Mathematics)

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University of  
St Andrews

## Overview

How, why, where?:

How do we write?

Why do we write?

Where can I publish my proof of the Hodge conjecture?

Plus: three steps towards better writing



**How do we write?**



## How do we write?

Pen and paper? Tablet? Dictation?



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Personalise: experiment with what works best for you



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Personalise: experiment with what works best for you

LaTeX for the final product

Planning; search e.g.

“how to write a Nature paper”

“how to write a paper (one possible answer)”



Some basics:

Follow standard conventions, notation, etc

Equations follow usual grammar, punctuation, etc

Structure: break up long derivations/proofs; paragraph

Provide signposts rather than show every step; avoid clutter

Use (good) examples

Re-read and revise: writing is an *iterative* process



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“Let  $x = z + ir$  be a complex number...”

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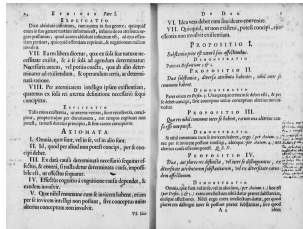
Treat equations as part of the sentence, not:

“We solve the ODE (1).

$$u(t) = u_0 e^{-\alpha t}$$

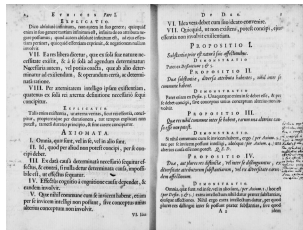
Where  $u_0$  is a constant.”





## Why do we write?

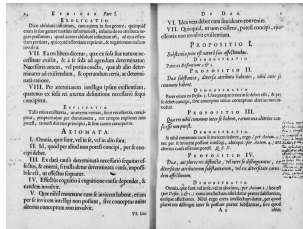
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## Why do we write?

General discussion, communication, collaboration

Contribute to the literature: own results, comments on others'



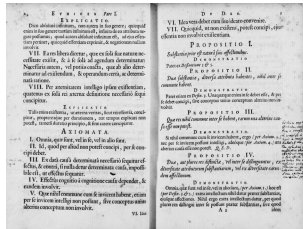
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General discussion, communication, collaboration

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To organise ones thoughts (memoranda, etc)

Career progression: thesis, papers, proposals, reviews, reports

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*Dem.*

$\vdash . *54.26 . \supset \vdash : . \alpha = t'x . \beta = t'y . \supset : \alpha \vee \beta \in 2 . \equiv . x \neq y .$

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From this proposition it will follow, when arithmetical addition has been defined, that  $1 + 1 = 2$ .

**Where can I publish my proof that  $1 + 1 = 2$ ?**

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In peer reviewed journals

In conference proceedings

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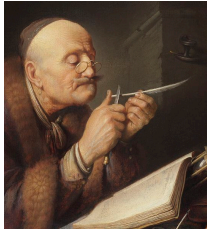
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On the arXiv



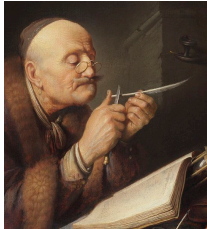
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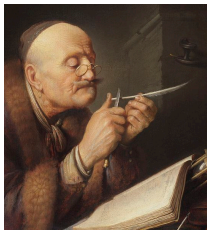




## **Towards better writing**

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Read “Lucidity and Science, I”.



## **Towards better writing**

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Read “Elements of Style”.

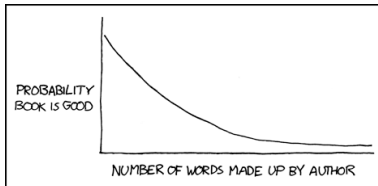


**Read**



Read

Garbage in, garbage out.



"THE ELDERS, OR FRAÅS, GUARDED THE FARMINGS (CHILDREN) WITH THEIR KRYTOSES, WHICH ARE LIKE SWORDS BUT AWESOMER.."



## Read

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Quality fiction, quality textbooks, quality papers, ...



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Language: less important?

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# Lucidity and science

## I: Writing skills and the pattern perception hypothesis\*

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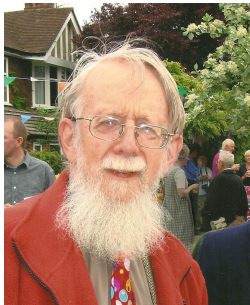
PROFESSOR MICHAEL E. McINTYRE

Centre for Atmospheric Science at the Department of Applied Mathematics and Theoretical Physics, University of Cambridge, UK

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Human perceptual processing has remarkable properties, the properties that enabled our ancestors to survive. Lucid writing exploits those properties. It makes efficient use of the reader's perceptual machinery. Anyone can use this idea to improve their writing and other communication skills, by taking account of verbal, musical, and visual perceptual phenomena. Such phenomena include unconscious gap filling and grouping, and the sensitivity to organically changing patterns.

## “Lucidity and Science” - Michael E. McIntyre



(...also “Lucidity in brief”, webpage)

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- builds patterns

- uses lucid repetition

- avoids “gratuitous variation”

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Lucid writing is highly explicit

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Lucid writing builds context before introducing new points:

- first occurrence* of an idea is critical

Organic change (e.g. charging rhinoceros):

some things remain invariant while others change



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build patterns, repeat key words consistently

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Be twice as explicit as you think necessary:

beware of **this!** (or these, it, its, they, etc)

“he had to wash, iron and milk three cows”

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“he had to wash, iron and milk three cows”

Order ideas coherently:

hard to do all at once: revise and edit ruthlessly!

take time over the first introduction of an idea

Gratuitous variation:

“Whereas the spectral method engenders Gibb’s fringes, no discretisation oscillations are manifested by the TDV algorithm.”

or

“Whereas the spectral method produces Gibb’s fringes, the TDV method produces no Gibb’s fringes.” (highly explicit)

or

“Whereas the spectral method produces Gibb’s fringes, the TDV method produces none.” (some gaps are filled automatically)

It is *not* just a matter of “style” (e.g. Three Mile Island)

Akin to changing a variable name midway through a derivation

## Lucid repetition, gap filling

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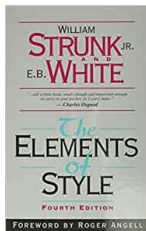
Lucid writing speeds up the whole writing process

10% saving of time/effort for writers, reviewers, **thesis examiners**  
etc

→ 0.5 billion USD/year

(from SCI, mid 1990s)

(not to mention wider gain to science and society from improved  
communication, etc)



## The Elements of Style

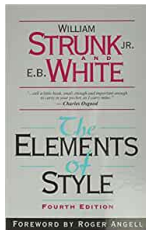


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“If you have any young friends who aspire to become writers, the second-greatest favor you can do them is to present them with copies of *The Elements of Style*. The first-greatest, of course, is to shoot them now, while they’re happy.”

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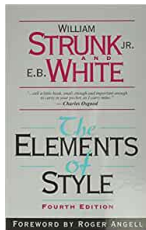
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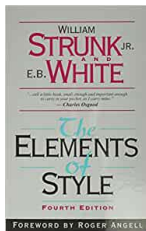
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“An aging zombie of a book.”

–The Boston Globe



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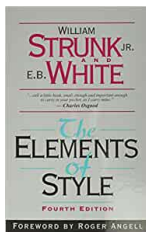
Omit needless words



## The Elements of Style

Omit needless words

(This does *not* mean use as few words as possible; if a word helps to clarify a word pattern then it is not needless)

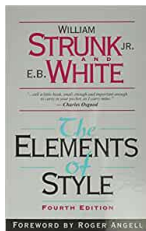


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Omit needless words

Use the active voice

(Often more compelling; not always appropriate)



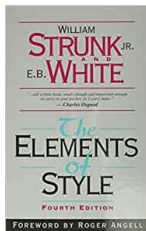
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Put statements in positive form

(don't avoid the omission of negatives)



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Omit needless words

Use the active voice

Put statements in positive form

(don't avoid the omission of negatives)

Use definite, specific, concrete language

## Summary

Read.

Read “Lucidity and Science, I” (including the Appendix).

Read “Elements of Style”.



## Summary

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Read “Elements of Style”.

Good writing is important.

Everyone can do it.