Writing an Academic Paper
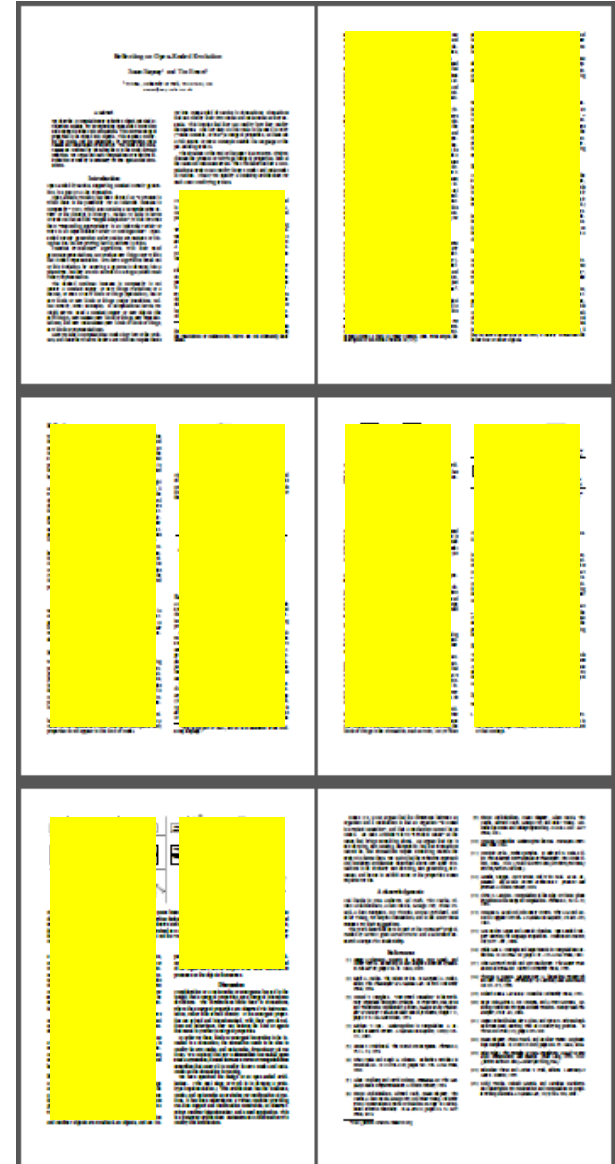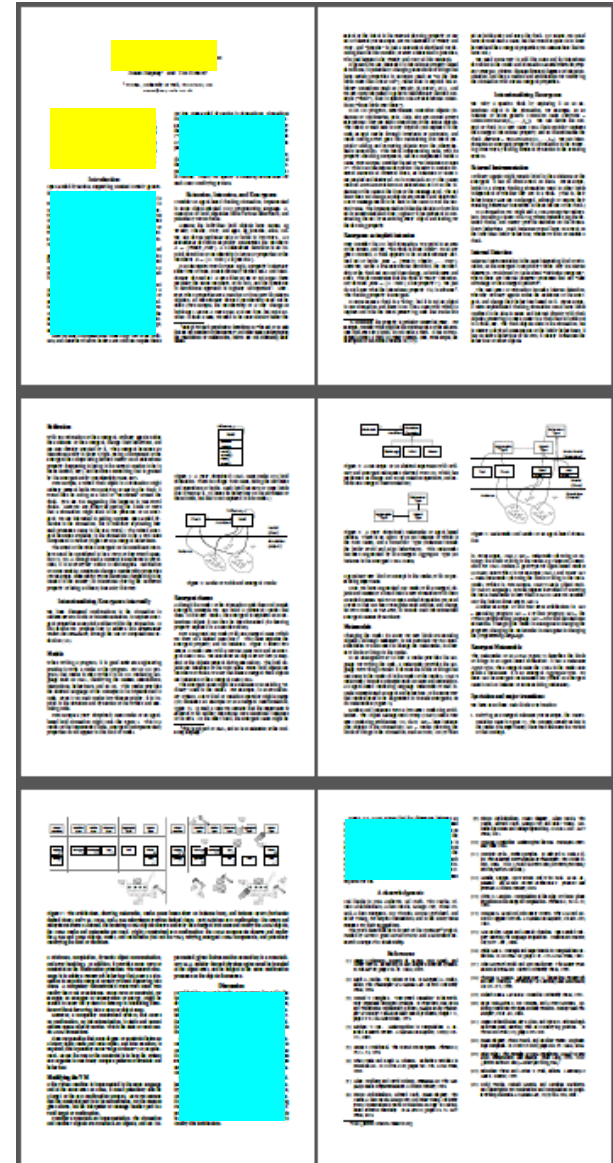
Susan Stepney

12 August 2015

what's in a paper?

- title

- abstract

- introduction

- body

- conclusions

- acknowledgements

- bibliography

- appendices

most papers are read twice:

once by the author,

and once by (one of) the referees

what's *read* in a paper?

- title

- abstract

- introduction

- body

- conclusions

- acknowledgements
- bibliography
- appendices

the title

- assume it is the only part of your paper that will be read!

- a very short summary

- be specific – summarise the *result*!

  - A novel genetic algorithm

  - A bacterial-inspired genetic algorithm

  - Faster convergence from a bacterial-inspired genetic algorithm

the abstract

- assume *it* is the only part of your paper that will be read!

- a summary of the *entire* paper
    1. what the problem is
    2. how you tackled it
    3. what you discovered

- it is *not* the blurb for a *"who-dunnit"*
    - you should include the "punchline"
    - that's not a spoiler!

- make the reader want to read more...
    - but leave them with the whole story if they don't

THEATRE III PRESENTS:

THE BUTLER DID IT

BY: Tim Kelly

WINTER OF 1992
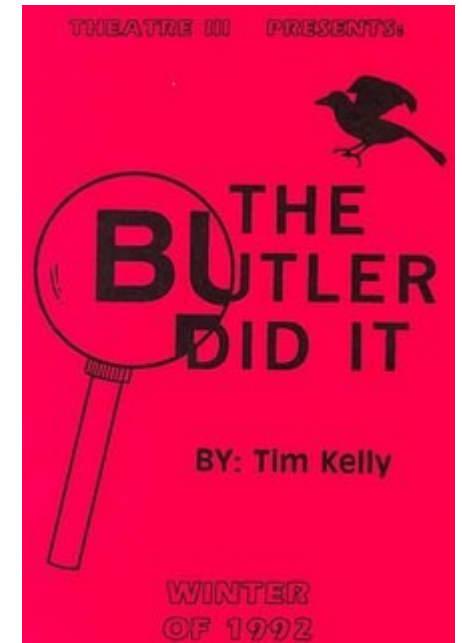
Can apparent superluminal neutrino speeds be explained as a quantum weak measurement?

M V Berry[1], N Brunner[1], S Popescu[1] & P Shukla[2]

[1]H H Wills Physics Laboratory, Tyndall Avenue, Bristol BS8 1TL, UK

[2] Department of Physics, Indian Institute of Technology, Kharagpur, India

Abstract

Probably not.

You are not writing a novel.

But you *are* telling a story.

(a *how*-dunnit, if not a *who*-dunnit)

a (short) story

- a coherent and interesting plot
  - making a *single* point

- nothing left out that is needed
  - definitions, parameters, algorithms – remember your audience

- nothing included that is not needed
  - no superfluous or irrelevant detail – keep it clear and straighforward

Perfection is attained not when there is nothing more to add, but when there is nothing more to take away.

-- Antoine de Saint-Exupéry. ***Wind, Sand and Stars,*** **1939**

MAGIC criteria for a good "story"

- **M**agnitude
  - how "big" is your result? is it worth reporting?

- **A**rticulation
  - how well have you told the story? are all the details relevant?

- **G**enerality
  - have your results got wider applicability than the specifics of the paper?

- **I**nterestingness
  - does this change the way people should think about the problem?

- **C**redibility
  - are your results believable? how strong is the evidence?

Robert P. Abelson. *Statistics as Principled Argument*. Lawrence Erlbaum Associates. 1995
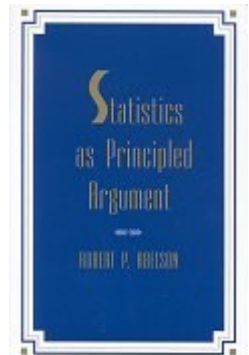
get your story straight

- what is the problem?

- how did you tackle it?

- what did you discover?

- so what?

what is the problem?

- why should the reader be interested?
  - context

- what does the reader need to know to understand the rest of the paper?
  - background

how did you tackle the problem?

- what did you do?

- how did you pose the problem in a testable manner?
- what was your approach
  - necessary and sufficient detail for reproducibility
- what was the outcome?

- structure depends on the kind of problem:
  - requirements / design / implementation / evaluation
  - conjecture / proof / theorem
  - hypothesis / experiment / results / analysis
  - …

detail and appendices

- some material is *important*
  - that necessary and *sufficient* detail

- but it gets in the way of the *story*
  - it is necessary for reproducability, but not for understanding

- that's what appendices are for
  - structure the story assuming they won't be read

what did you discover?

- results
  - outcome

- evaluation and conclusion
  - did it work?
  - how well did it work?

- how does this solve the original problem?

- what you now know that you didn't before
  - expand the context

so what?

- why is the result of any interest to the reader?

- how is the world a better/different place?

- what next?
  - future work

incremental (un-MAGICal?) advances

- most papers don't present earth-shattering results

- show the relevance and importance of *your* "piece of the jigsaw"
  - how you contribute to the bigger picture
  - what future work this suggests – work than can be based on your contribution

writing order

- a story should have a beginning, a middle, and an end …
- but you don't have to *write* it in that order

- middle out often works
- get the story straight
    - write the headings for the body
        - "pseudocode" of the story
    - fill them out
    - conclusions
    - introduction
    - abstract
    - title

writing stages

- trying to get it "right first time" is the quickest way to writer's block

- **plan** – a story board for your story

- **draft** – the first cut

- **edit** – remove the irrelevant

- **polish** – check for clumsy phrasings

- **review** – you, and others – for comprehension, for grammar

- **proof-read** and **spell-check** – the *last* thing you do

read to learn readability

- if you read a "good" paper …
    - one you find particularly readable or engaging

- try to figure out what made it good
    - structure, level of detail, prose style, use of figures, whatever

- and then apply that to your own work
    - where it is appropriate to do so

Everything you were taught about "creative writing" is wrong

(for an academic paper)

you have four languages to use

- choose which is most appropriate for each piece of the story

1. pictures / diagrams / charts
   - beware – not all pictures are worth 1000 words!
2. mathematics
3. pseudocode
4. natural language
   - but not one big block of prose
     - use headings / subheadings (allow skim reading)
     - bullet lists
   - explain intent of diagrams / maths / pseudocode

do *not* "vary your vocabulary"

- one concept – one name
  - "synonyms" rarely mean *exactly* the same thing
- variation misleads the reader into searching for subtle distinctions where none exist
- it is better to sound repetitive than be confusing

- be careful with "this" and "that"
  - repeat the noun if needed (see repetition, above)

avoid purple prose

- strike out adjectives
  - an adjective implies a *subclass* – is that what you mean, or are you "varying your vocabulary"?
- strike out "filler" phrases

- write for non-native speakers
  - eschew obfuscation …

- prefer short sentences
  - sometimes you need a long sentence – but not all the time!
- try reading the text out loud
  - do you get out of breath? shorten the sentence!
  - do you stumble over parsing? simplify the sentence!

use the present tense

- present tense
  - "In chapter 3, I **derive** the result"
    - *NOT* "I will derive the result" ... by the time the reader *reads* at chapter 3, you *will* have derived the result
  - Smith [42] **derives** the result
    - even if Smith the person did this in 1901, the *paper* **Smith [42]** is still here today
- past perfect
  - "I **have derived** the result" ... in previous work, and it is still true today
  - *NOT* "Smith [42] derived the result" ... but it was overturned later
- future
  - In my next paper, I **will derive** the result
    - only for things you haven't done by the time the paper is *finished*

breaking the rules

break rules knowingly

- these are guidelines

- so follow them!

- as you get more experienced, you will notice times when they don't quite work

- so break them!

- but, know *what* you are doing, and *why* you are doing it

- and don't sacrifice clarity