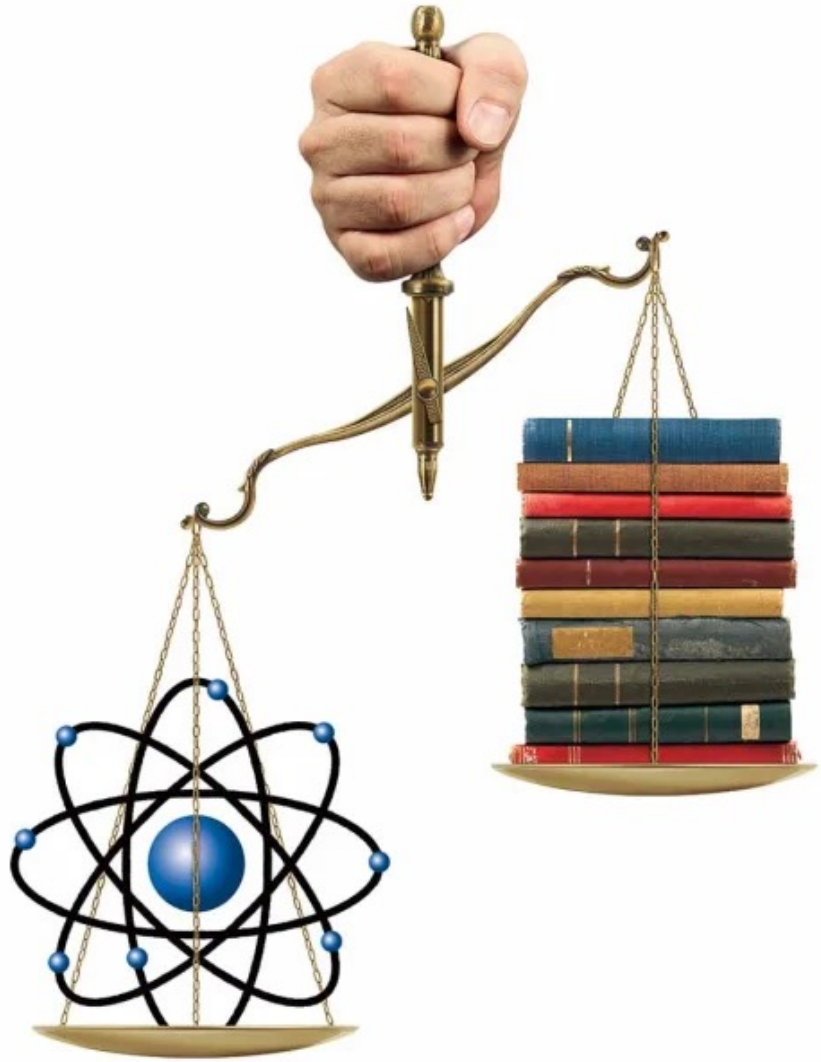
Writing and communicating your science

Henri Boffin

ESO



Getty Images (2); Illustration by Tomasz Walenta for TIME

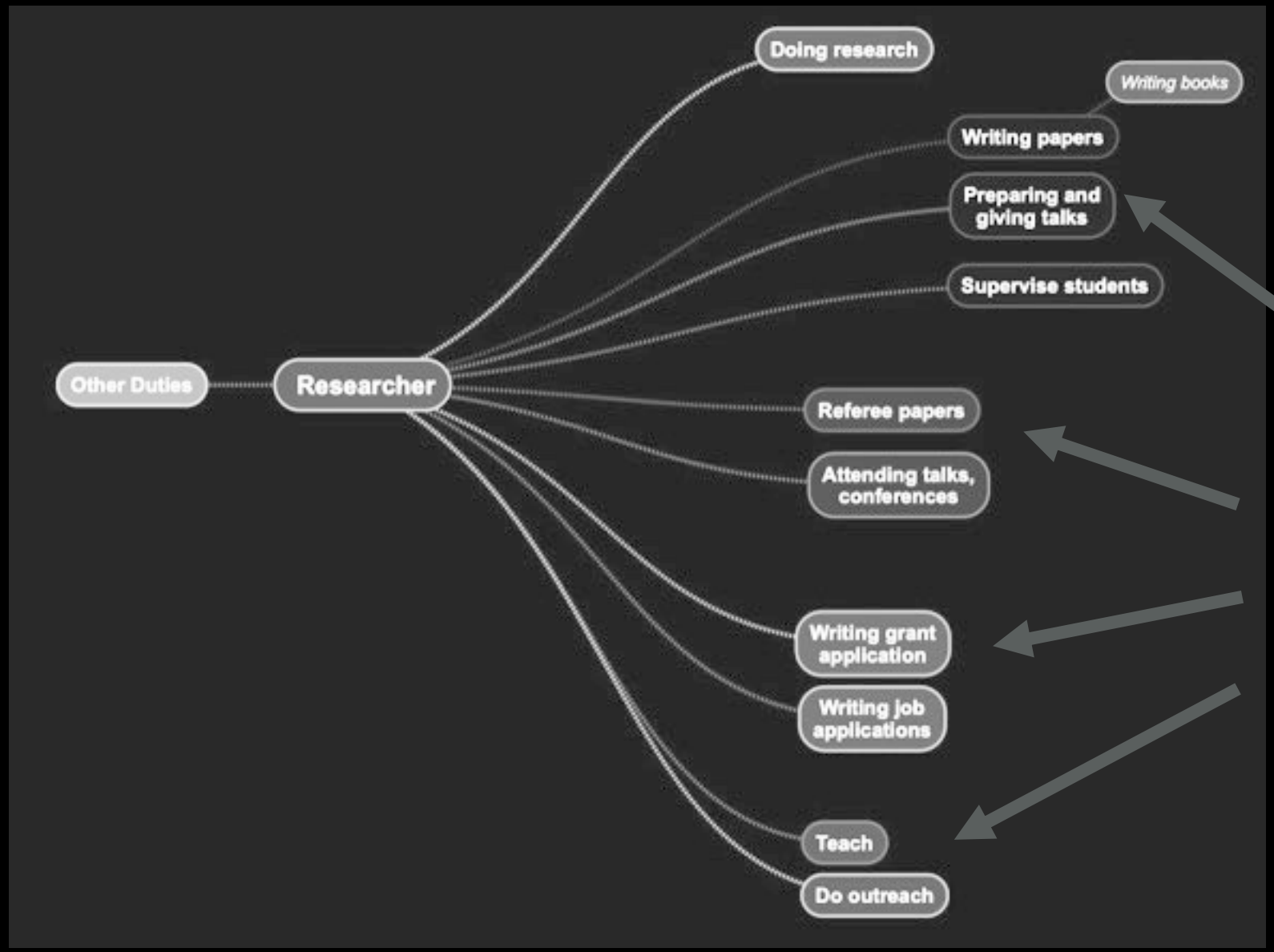
Nothing in science has any value if it is not communicated.

— Anne Roe —

The Making of a Scientist

AZ QUOTES

What does an astronomer do?



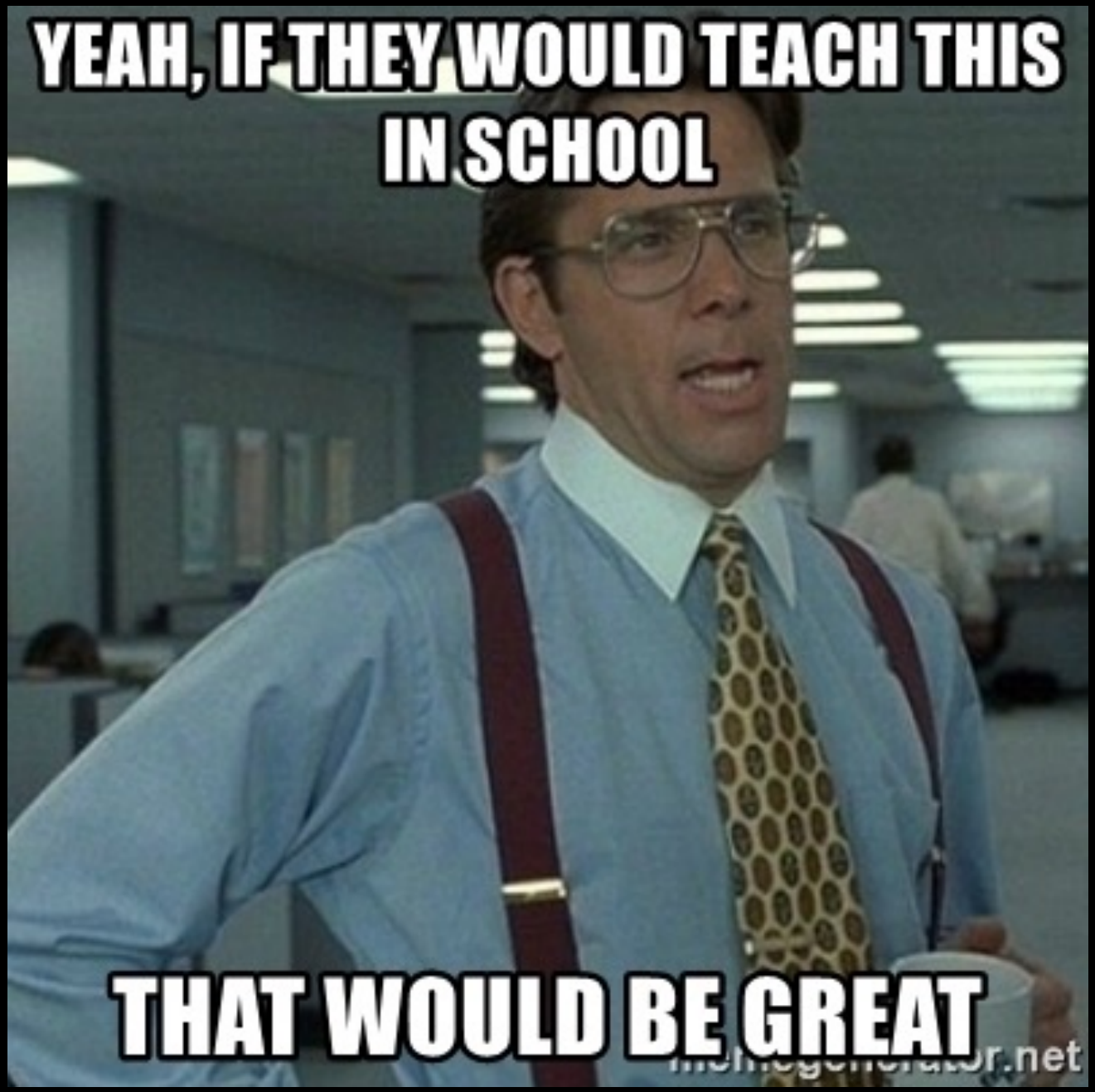
A good researcher needs to be a good communicator!

Writing skills (in English!)
Presentation skills

"*Your success as a scientist will depend on your ability to **speak**, your ability to **write**, and the quality of your ideas, in that order.*"

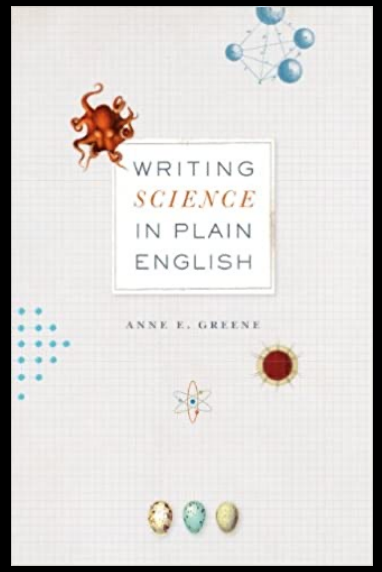
—P. Winston, MIT

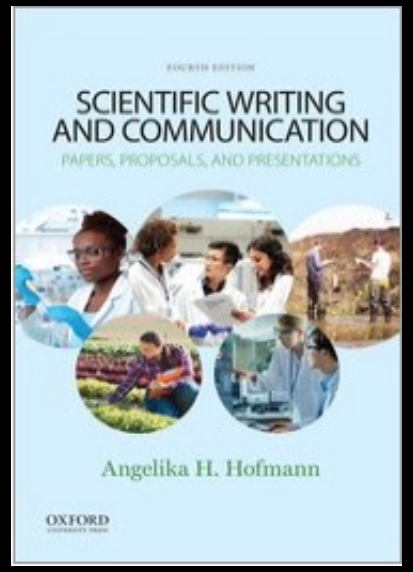
https://www.fems.org/news/how-write-paper-about-your-research

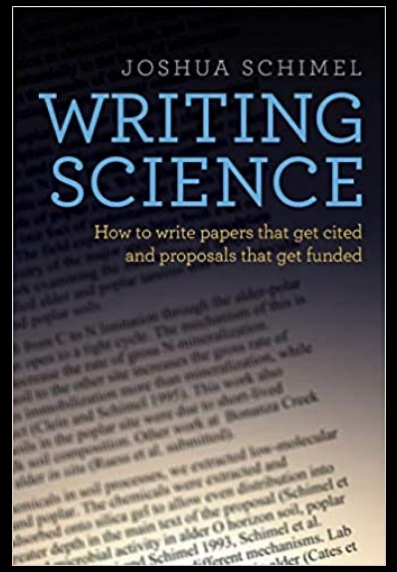

YEAH, IF THEY WOULD TEACH THIS IN SCHOOL
THAT WOULD BE GREAT

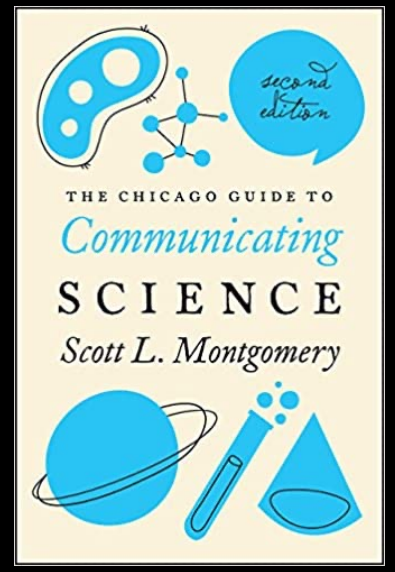
The same way you learned how to solve an equation or make an experiment, **you can learn to write**

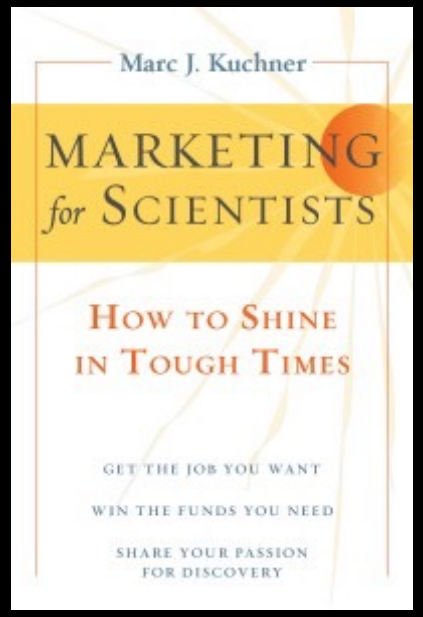
Writing is an art and can be perfected

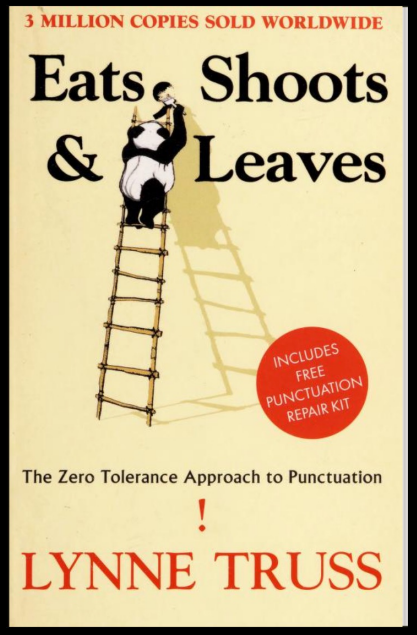

WRITING
SCIENCE
IN PLAIN
ENGLISH
ANNE E. GREENE


SCIENTIFIC WRITING
AND COMMUNICATION
PAPERS, PROPOSALS, AND PRESENTATIONS
Angelika H. Hofmann
OXFORD


JOSHUA SCHIMEL
WRITING
SCIENCE
How to write papers that get cited
and proposals that get funded


second edition
THE CHICAGO GUIDE TO
Communicating
SCIENCE
Scott L. Montgomery


Marc J. Kuchner
MARKETING
for SCIENTISTS
HOW TO SHINE
IN TOUGH TIMES
GET THE JOB YOU WANT
WIN THE FUNDS YOU NEED
SHARE YOUR PASSION
FOR DISCOVERY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The Zero Tolerance Approach to Punctuation
!
LYNNE TRUSS


Why Science Needs Story
HOUSTON,
WE HAVE
A NARRATIVE
Randy Olson

Nature astronomy 2022

nature astronomy

PERSPECTIVE

https://doi.org/10.1038/s41550-022-01757-1

Check for updates

How to plan your astronomy research paper in ten steps

Nushkia Chamba[1]✉, Johan H. Knapen[2,3,5] and Diane Black[4,5]

Scientific writing is an important skill for a career as a professional astrophysicist. However, very few researchers receive any formal training in how to write scientific research papers of high quality in an efficient manner. This Perspective is the first of a two-part self-help guide to scientific writing to address this skills gap. This part focusses on planning your academic research paper in astronomy. We discuss how to crystallize the ideas that underlie a research project, analyse how the paper can be constructed considering the audience and the chosen journal, and give an overview of the publishing process. Whether you are a student writing your first paper or an experienced author, you may find the ideas presented here useful.

nature astronomy

PERSPECTIVE

https://doi.org/10.1038/s41550-022-01759-z

Check for updates

How to write and develop your astronomy research paper

Johan H. Knapen[1,2,5]✉, Nushkia Chamba[3,5] and Diane Black[4,5]

Writing is a vital component of a modern career in scientific research. But how to write correctly and effectively is often not included in the training that young astronomers receive from their supervisors and departments. We offer a step-by-step guide to tackle this deficiency, published as a set of two Perspectives. In the first, we addressed how to plan and outline your paper and decide where to publish. In this second Perspective, we describe the various sections that constitute a typical research paper in astronomy, sharing best practice for the most efficient use of each of them. We also discuss a selection of issues that often cause trouble for writers from sentence to paragraph structure—the 'writing mechanics' used to develop a manuscript. Our two-part guide is aimed primarily at MSc- and PhD-level students who face the daunting task of writing their first scientific paper, but more senior researchers or writing instructors may well find the ideas presented here useful.

A good writer is a good reader

Read, read, read! (in English)

The New Yorker
The Guardian, The New York Times

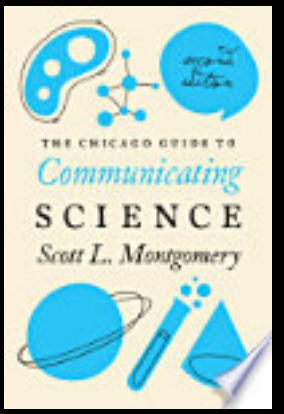
New Scientist
Nature, Science

Learn to write

Collect examples of especially good writing whenever you come across them

Go over them in an attentive manner

Reread them on a regular basis



S. Montgomery

Adopting tricks of the trade from colleagues is done everywhere else in research – why not in writing?

Beware plagiarism, blatant copying, and appropriation.

Be honest about whose work you **emulate** – and thank them for inspiring you!

Writing process

Prewriting

Drafting

Revising

Editing

Evaluating

Publishing

Kalyan KS • 3rd+
NLP Researcher | Deep Learning | Transformers | ML4H@NeurI...
1w • Edited •

+ Follow

This is the situation of some of the journals.
#academicchatter #phdlife #phdresearch #phdchatter #researchlife #phdvoice #phdstudent #research

...see more

Prewriting

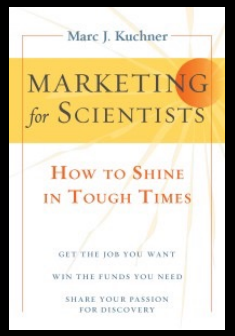
One paper = One idea

Write it down

(not as part of the paper)

Discuss with colleagues

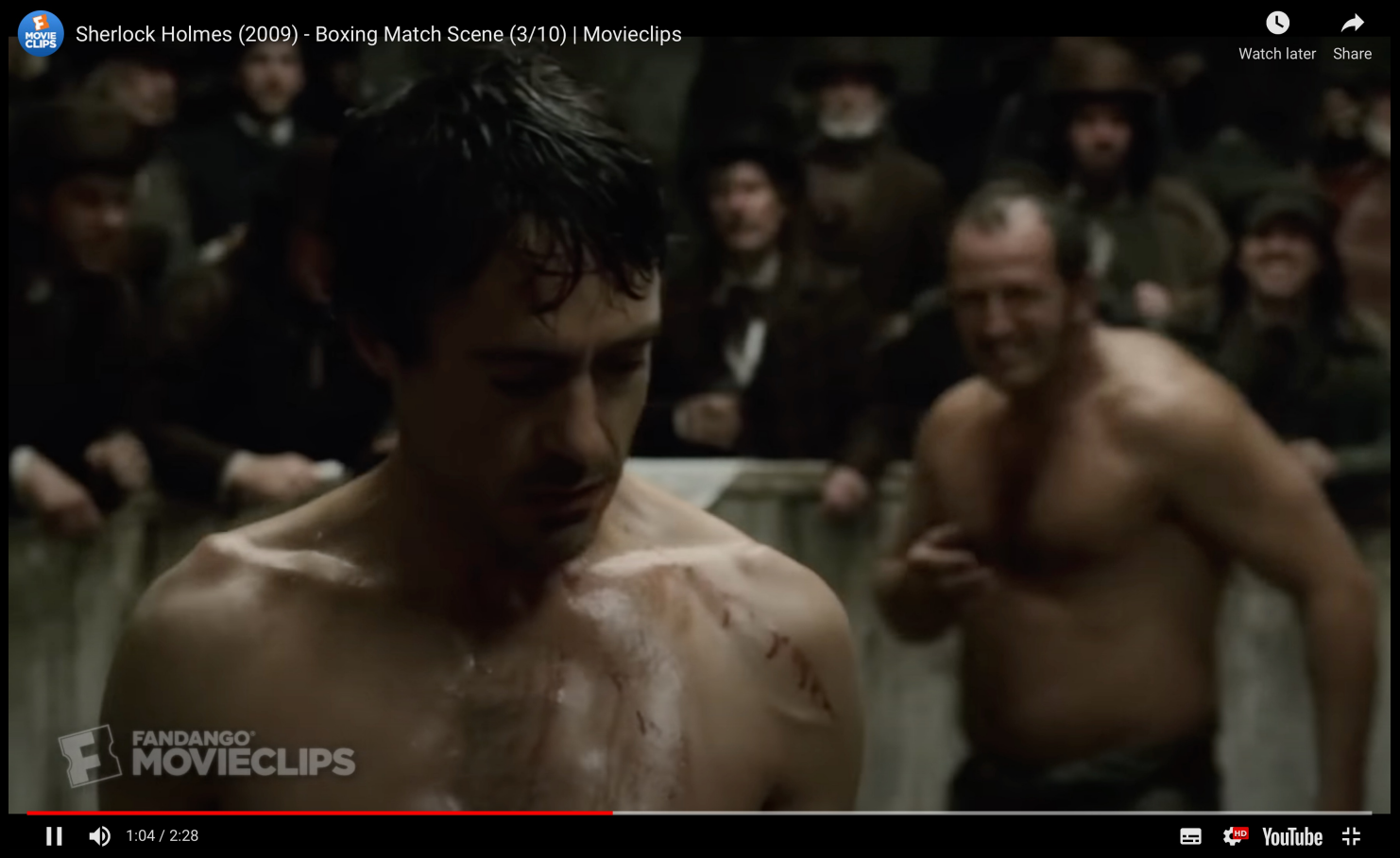
Write an outline of the paper



See also
Erin McKea

Before starting to write

Invent and own a new word!

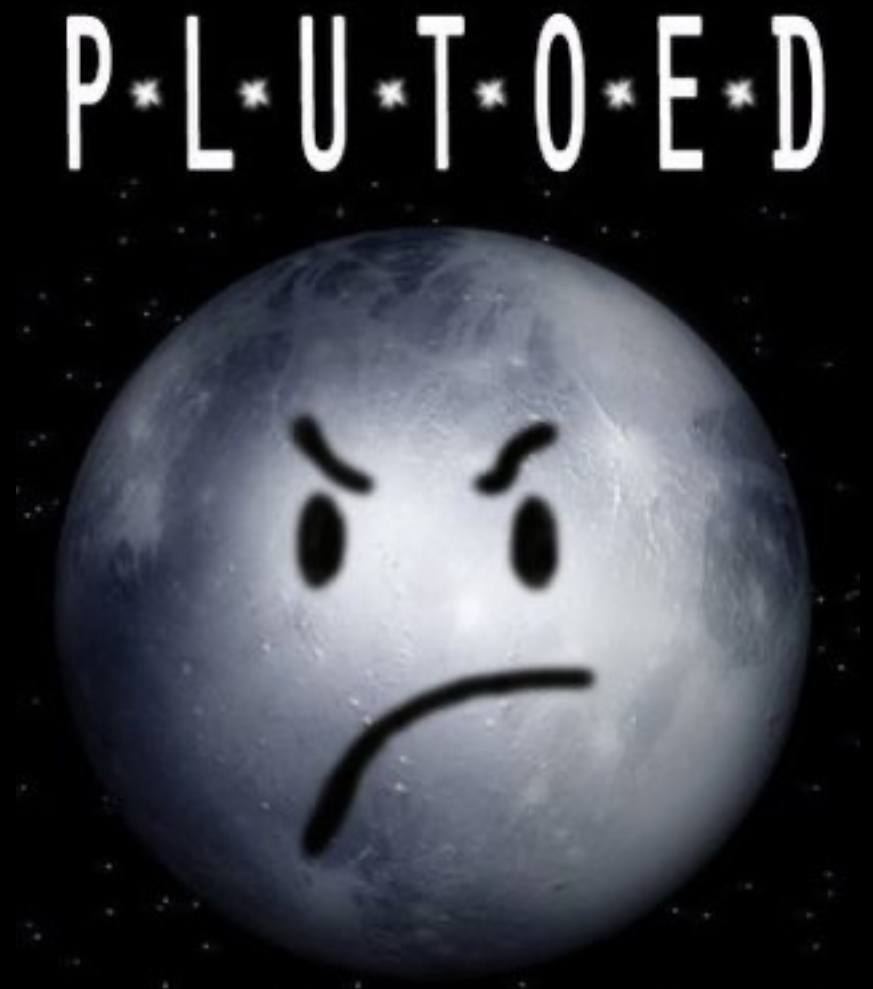


"First distract the target, then block his blind jab and counter.
Then discombobulate!"

Discombobulate: to throw into a state of confusion.

Recombobulate

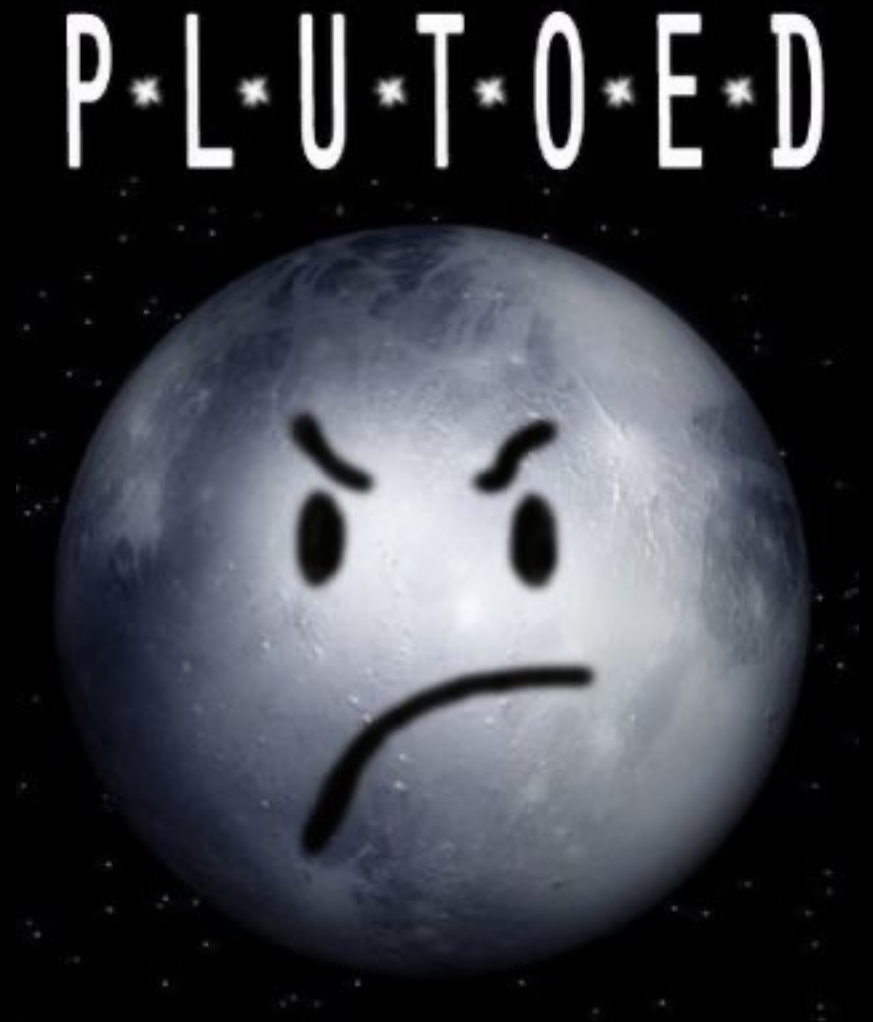
To cause to think clearly again; to reorient; to put back into working order.



English word
of the year
2006

to be demoted without due cause or reason

Anne Curzan: https://www.youtube.com/watch?v=F6NU0DMjv0Y



I was captain of the ship for one day, but then I was plutoed.

Anne Curzan: https://www.youtube.com/watch?v=F6NU0DMjv0Y

Science is made of new words

electron
neuron
bacteria
gravity
black hole
dark energy
inflation
quark
pulsar
quasar
big bang

"One could say that scientific progress is done through new words!"

M. Kuchner

LETTER

https://doi.org/10.1038/s41586-018-0625-x

Gaia Enceladus

The merger that led to the formation of the Milky Way's inner stellar halo and thick disk

Amina Helmi[1]*, Carine Babusiaux[2,3], Helmer H. Koppelman[1], Davide Massari[1], Jovan Veljanoski[1] & Anthony G. A. Brown[4]

The *Gaia Sausage* is an elongated structure in velocity space discovered by Belokurov et al. (2018) using the kinematics of metal-rich halo stars. It was created by a massive dwarf galaxy ($\sim 5\times10^{10}M_{\odot}$)

If you have really a completely new idea,

invent a new word!

If you can’t justify one, then try to define an **acronym** for your project

POPIPlaN: A Deep Morphological Catalogue of Newly Discovered Southern Planetary Nebulae

Structure of a Paper

IMRaD format

Title
- Authors

Abstract
- Keywords

Introduction

(Materials and) **M**ethods/Observations

Results (includes *figures* and tables)

Discussion

Conclusion
- Acknowledgements
- References
- Appendices

Order in a paper.
Not necessarily the order in which you write it!

The luminous blue variable HR Carinae has a partner★

Discovery of a companion with the VLTI

Henri M. J. Boffin[1,2], Thomas Rivinius[1], Antoine Mérand[1], Andrea Mehner[1], Jean-Baptiste LeBouquin[3], Dimitri Pourbaix[4,★★], Willem-Jan de Wit[1], Christophe Martayan[1], and Sylvain Guieu[1,3]

[1] ESO, Alonso de Córdova 3107, Casilla 19001, Santiago, Chile
e-mail: hboffin@eso.org
[2] ESO, Karl-Schwarzschild-str. 2, 85748 Garching, Germany
[3] Institut de Planétologie et d'Astrophysique de Grenoble (UMR 5274), BP 53, 38041 Grenoble Cedex 9, France
[4] Institut d'Astronomie et d'Astrophysique, Université Libre de Bruxelles (ULB), 1050 Bruxelles, Belgium

Received 16 June 2016 / Accepted 18 July 2016

Acknowledgements. It is a pleasure to thank Steve Ertel for taking the data in January 2015 in delegated Visitor Mode. The archival AMBER observation was obtained under ESO Prog. ID 085.D-0490.

A&A 619, A84 (2018)
https://doi.org/10.1051/0004-6361/201833693

Astronomy & Astrophysics

When nature tries to trick us

An eclipsing eccentric close binary superposed on the central star of the planetary nebula M 3-2⋆,⋆⋆

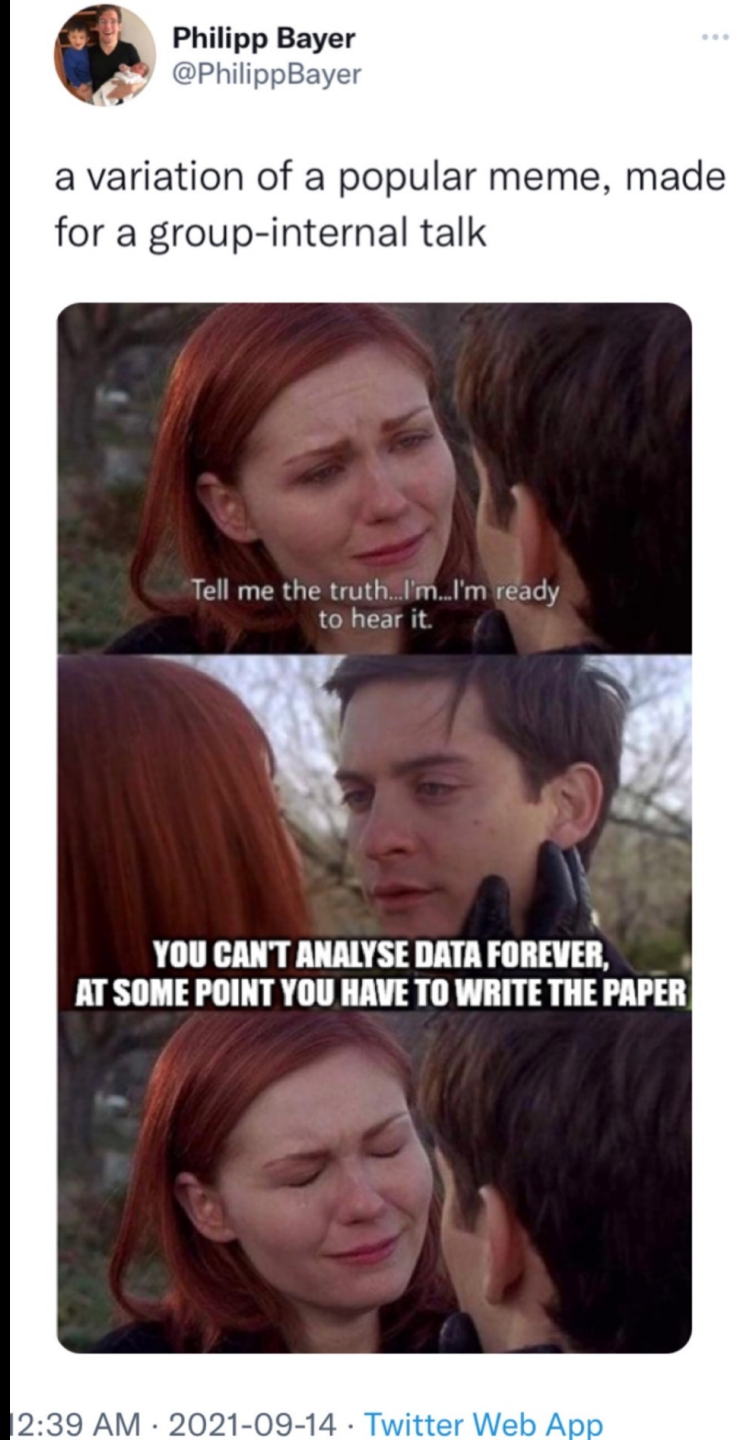
Henri M. J. Boffin[1], David Jones[2,3], Roger Wesson[4], Yuri Beletsky[5], Brent Miszalski[6,7], Ivo Saviane[8], Lorenzo Monaco[9], Romano Corradi[10,2], Miguel Santander García[11], and Pablo Rodríguez-Gil[2,3]

(Affiliations can be found after the references)

Received 21 June 2018 / Accepted 27 July 2018

Writing process

Drafting



Writing Process – Drafting

Write quickly

Do not ponder over words; keep going; leave gaps if necessary; aim for a natural flow

Write in your own voice

Express yourself in your own way will help you to say what you mean more exactly; if your reader can 'hear' your voice, reading will be easier

Write without interruption

Try to find a time and place where you can think and write without distractions

"***After finishing a rough draft**, I would spend the rest of the day obsessing about getting creamed by a car before I could write a decent second draft. I'd worry that people would read what I'd written and **believe that the accident had really been a suicide**."*

—Anne Lamott's Bird by Bird: Some Instructions on Writing and Life

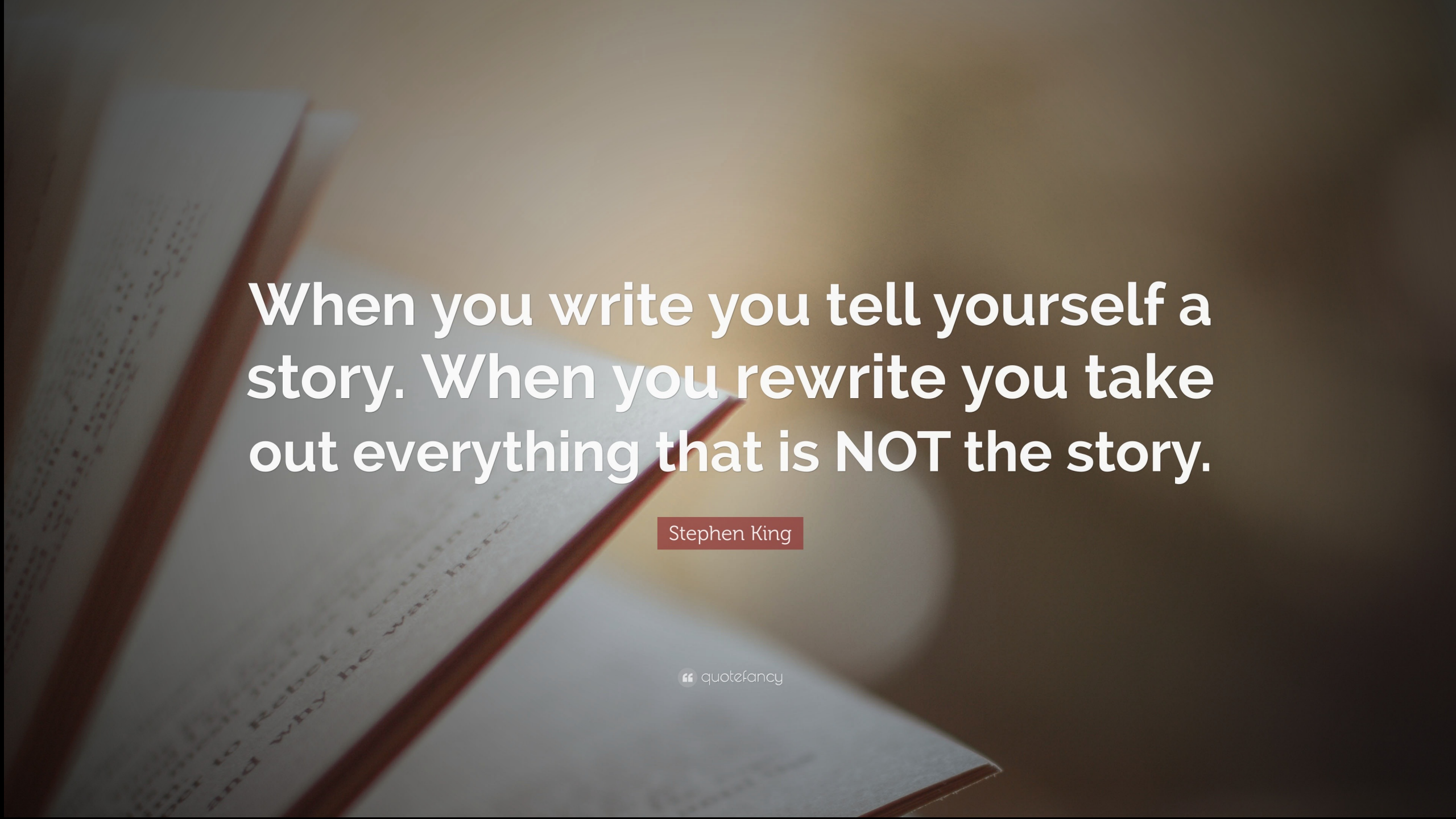
Writing process

Revising

Revise

The writer becomes a reader and makes changes.

During revision, you should delete what is not needed and add what is missing


When you write you tell yourself a story. When you rewrite you take out everything that is NOT the story.
Stephen King
quotefancy

Writing process

Editing

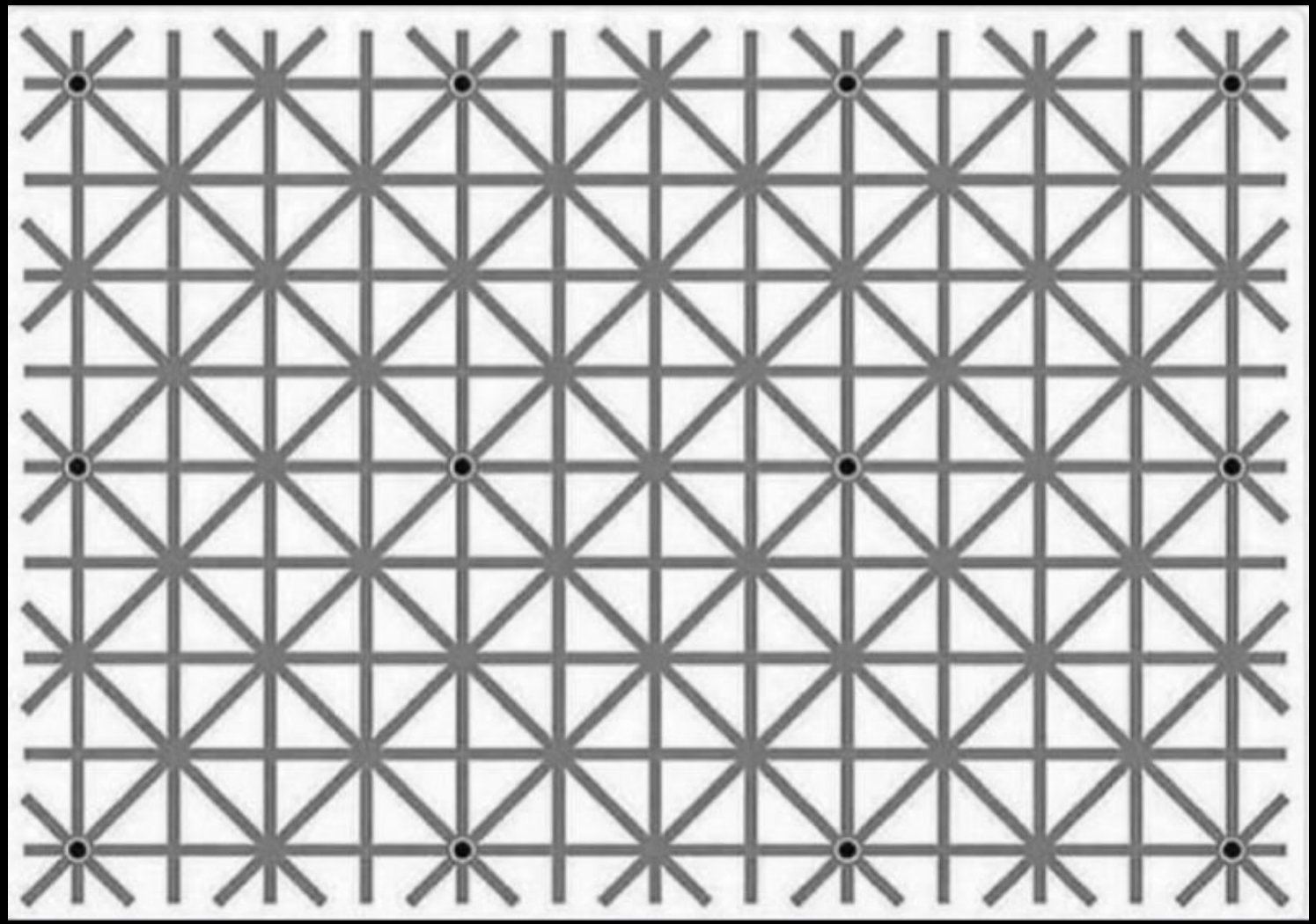
Editing Hints

Read the paper once all the way through

Reread all the way through out-loud or backwards

Fi yuo cna raed tihs, yuo hvae a sgtrane mnid too.

It dseno’t mtaetr in what oerdr the ltteres in a wrod are. The olny iproamtnt tihng is taht the frsit and lsat ltteer msut be in the rghit pclae.



Editing Hints

Read the paper once all the way through

Reread all the way through out-loud or backwards

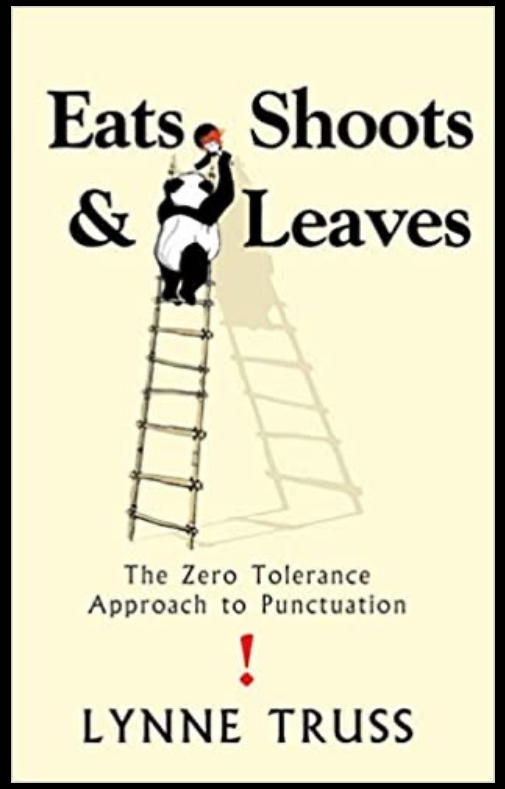
Look for

Passive voice
Inconsistent verb tenses and subject/verb disagreement
Improper pronoun references
Jargon
Typos

The Panda's story

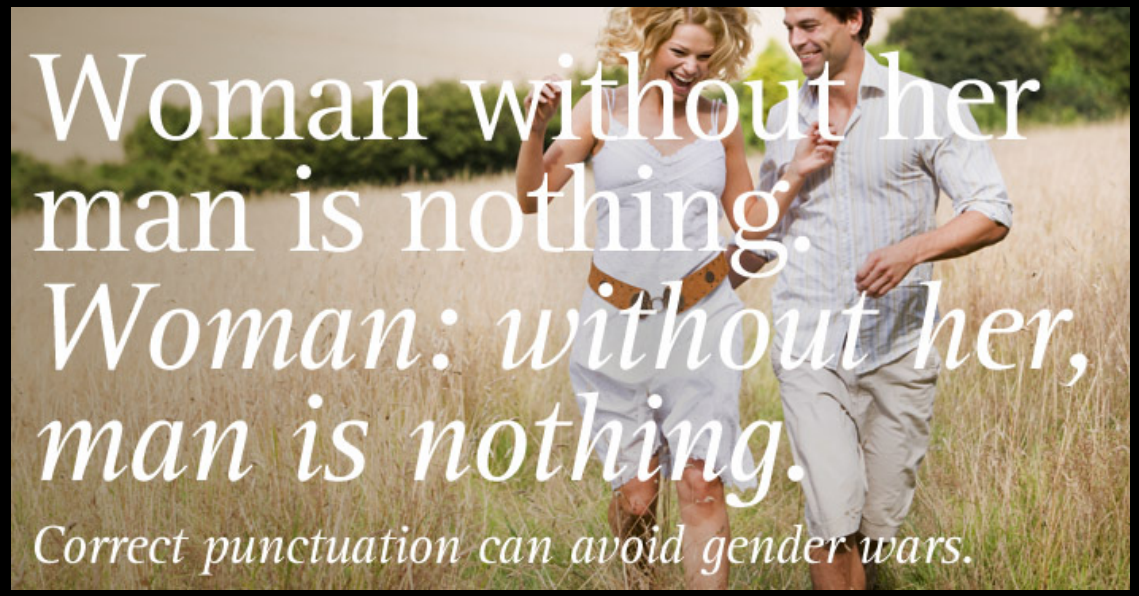
The Panda eats, shoots, and leaves

The Panda eats shoots and leaves



Punctuation does matter!

Use punctuations correctly



Reading levels

Title (general audience)

Abstract

Main text (specialised audience)

Adapted from

nature masterclasses

Title of your paper is essential: make it engaging

FORS-Up: May the FORS Be With Us For Another 15 Years

When a couple's squabbling leads to cosmic bubbles

Towards an engaging title

Characterisation of the eclipsing post-common-envelope binary central star of the planetary nebula Ou 5

The post-common-envelope binary central star of the planetary nebula Ou 5: a doubly-eclipsing post-RGB system

Astron. Astrophys. 205, 155–163 (1988)

Can a barium star be pro

H.M.J. Boffin* and A. Jorissen*

Institut d'Astronomie, d'Astrophysique et de G
Av. F. Roosevelt 50, B-1050 Bruxelles, Belgium

Received January 29, accepted May 18, 1988

Astron. Astrophys. 205, 155–163 (1988)

ASTRONOMY AND ASTROPHYSICS

Can a barium star be produced by wind accretion in a detached binary?

H.M.J. Boffin* and A. Jorissen*

Institut d'Astronomie, d'Astrophysique et de Géophysique, Université Libre de Bruxelles, C.P. 165, Av. F. Roosevelt 50, B-1050 Bruxelles, Belgium

Received January 29, accepted May 18, 1988

Summary. Although Roche lobe overflow scenarios are usually quoted in relation with barium stars (Iben and Tutukov, 1985; Webbink, 1986), we show that a wind accretion model is better suited for explaining the barium phenomenon. This model assumes that barium stars result from the accretion of part of the matter ejected through a wind and a planetary nebula by a heavy element-rich asymptotic giant branch star, the system remaining always detached. In this first, exploratory study, a very simple, semi-analytical algorithm is used. We show that the contamination of the barium star (i.e. the ratio of accreted mass to the envelope mass) only depends on the present values of the orbital separation and of the mass of the white dwarf companion, thus predicting a correlation between the Barium anomaly and these two parameters. The results of our model are applied to the system ζ Capricorni, for which a relatively good agreement is found. Moreover, the efficiency of accretion (calculated using the hydrodynamical accretion cross section as given by Bondi and Hoyle, 1944) in the wind scenario is great enough to be able to explain systems with periods as long as 100 years! In contrary to what is expected if Roche lobe overflow occurs, the wind scenario allows eccentric orbits (as observed for barium binaries) to survive the mass transfer process.

Key words: barium stars – accretion – mass loss – spectroscopic binaries

(ii) transfer of contaminated matter from a companion star onto the present Ba II star, as suggested by the discovery that Ba II stars belong to binary systems (McClure, 1983; Jorissen and Mayor, 1988). However, no quantitative analysis of these widely quoted mass transfer scenarios has ever been performed up to now.

What we present here is a first quantitative attempt to explain Ba II stars by contamination through a *stellar wind* originating from a heavy element-rich AGB star, the system remaining always detached. This simple model is shown to be in better agreement with various observational constraints (summarized in the remaining of this section) than does the Roche lobe overflow scenario, which was first suggested by McClure (1983) in this context. Since then, this scenario was frequently referred to, although there has never been any quantitative analysis demonstrating the real merits of the Roche lobe overflow scenario.

Properties of Ba II binaries are as follows. Up to now, seven single spectrum spectroscopic orbits are available (McClure, 1983). If HD77247 is excluded, the periods range from 450 days to several years. The eccentricities range from 0.0 to 0.33, with a mean value of 0.18 ± 0.05, while $A_2 \sin i$ varies between 0.38 and 0.93 AU (where A_2 is the semi-major axis of the barium star around the center of mass of the system). The elimination of HD77247 ($P = 80$ days) results from its atypical properties: (1) From its slight heavy element overabundances, Böhm-Vitense

Golden rule: Tell a Story

inverse.com

can get the greatest attention and get a message across

Humans have been telling stories since the origins of time, like in these cave paintings. Such stories are at the origin of language.

Our brains are wired such that stories become memorable

So if possible, your papers and your talks should be telling stories.

Even at the level of sentences, you need to have stories…

Tell a Story

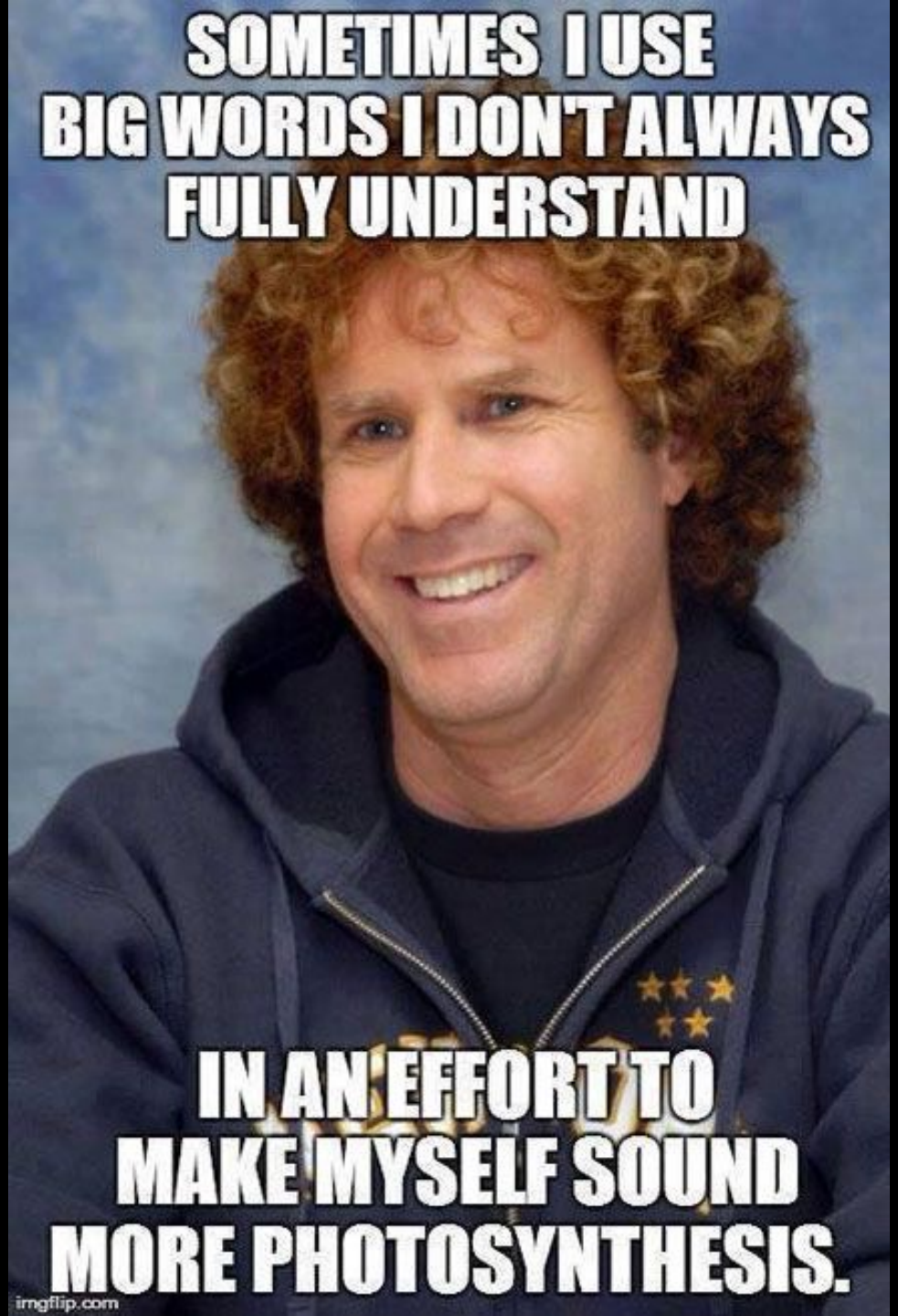
Characters
Actions

Make characters subjects and their actions verbs

Characters: tangible, concrete nouns

Favour the active voice

Only if a good reason exists to use the passive voice, use it – for example in the Methods section of your paper



Choose your Words with Care

Avoid long words

Don’t try to sound smart

Omit needless words

Proposals

Observing time

Supercomputing time

Grant proposal

Job application

Likely the most important documents
you have to write

Proposals

It is a story without an ending

It should make the reader
want to see the work done

Proposals

Every proposal reader constantly scans for clear answers to 3 questions:

1. What are we going to learn as the result of the proposed project that we do not yet know?
2. Why is it worth knowing?
3. How will we know that the conclusions are valid?

Avoid empty sentences

Avoid generic and empty sentences, especially at the start of your proposal. For example:

The study of […] is one of the key fields of modern astrophysics.

One can replace […] by your preferred subject and it will be true. But the reader didn't learn anything and will now have the feeling they will lose their time.

Start with a sentence that will trigger interest.

"*First sentences are doors to worlds.*"

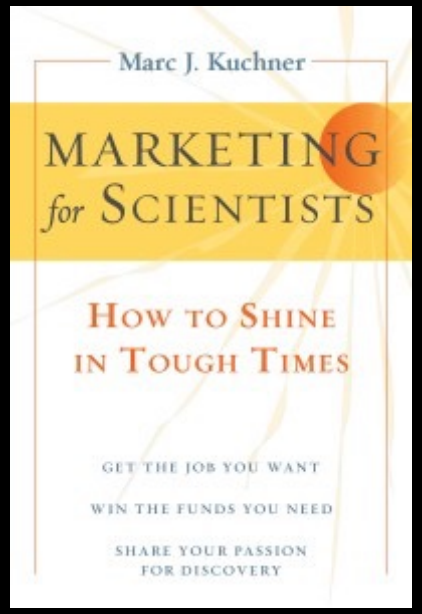
—Ursula K. Le Guin

The opening paragraph is your chance to grab the reviewer's attention.

Use it.

This is the moment to **overstate**, rather than understate, your point or question. You can add the conditions and caveats later.

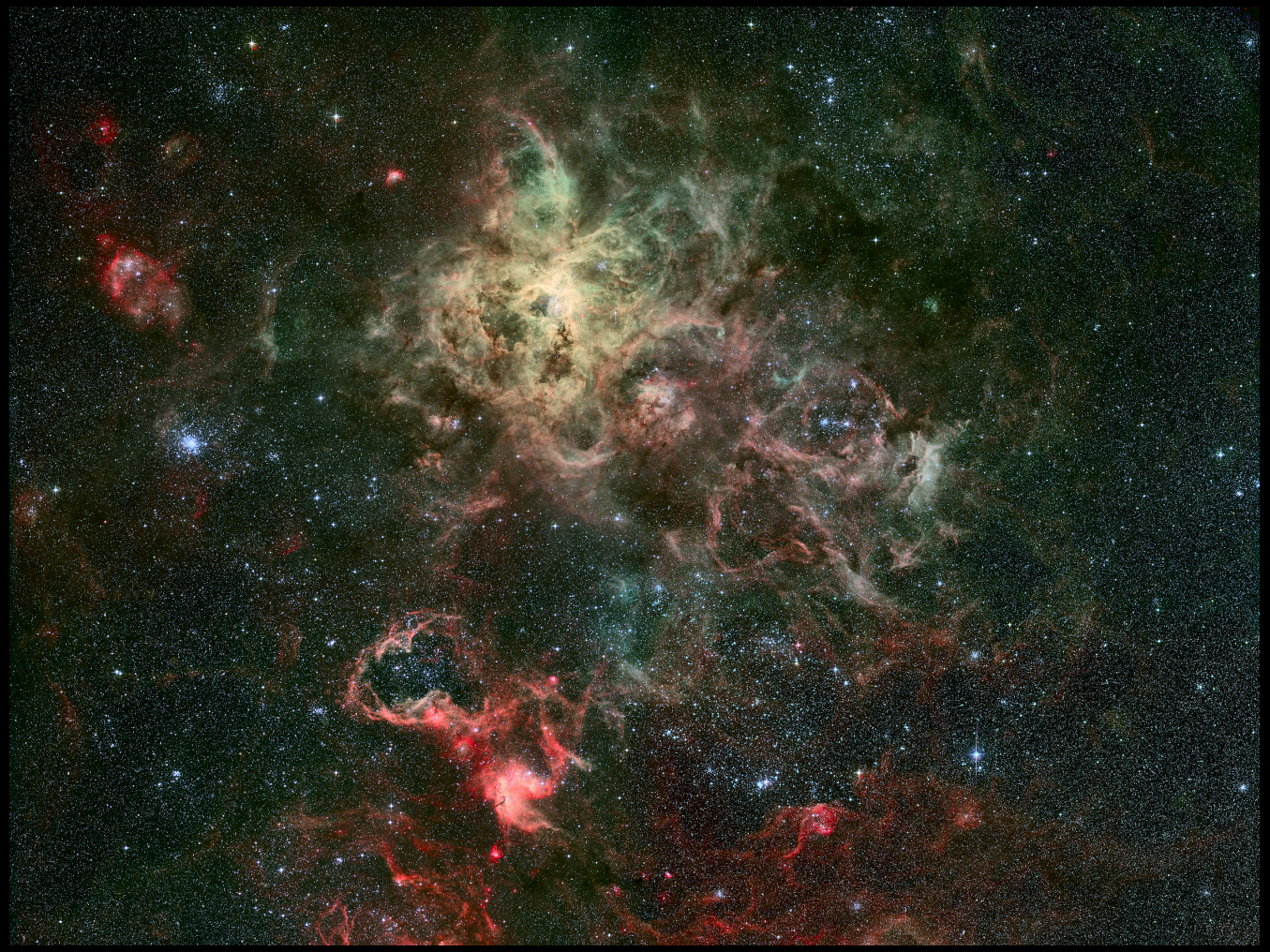
Proposals



Major proposal should contain 3 kind of figures

Your papers would benefit from this as well

Beautiful Butterfly Figure

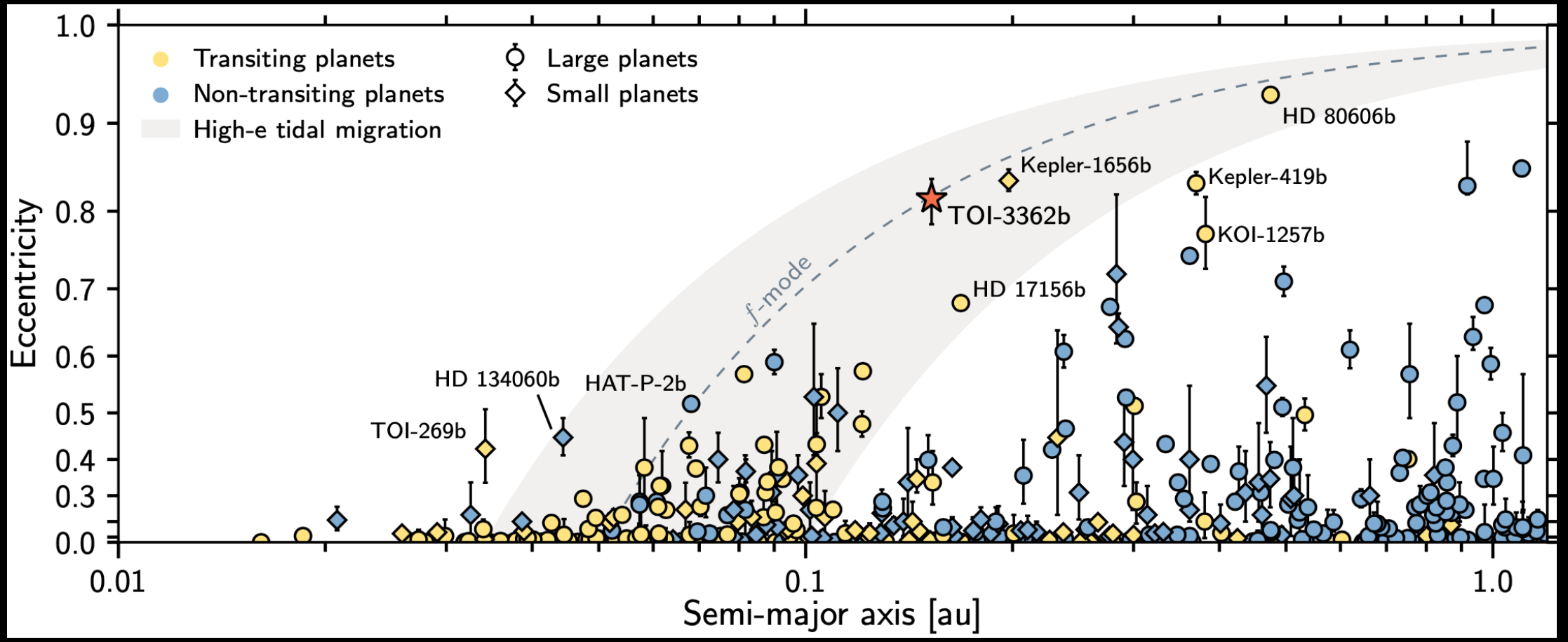


Many proposals start with one figure whose purpose is just to grab the reader's attention

– A pretty picture –

They also make good introductory slides for a talk.

Family Portrait Figure



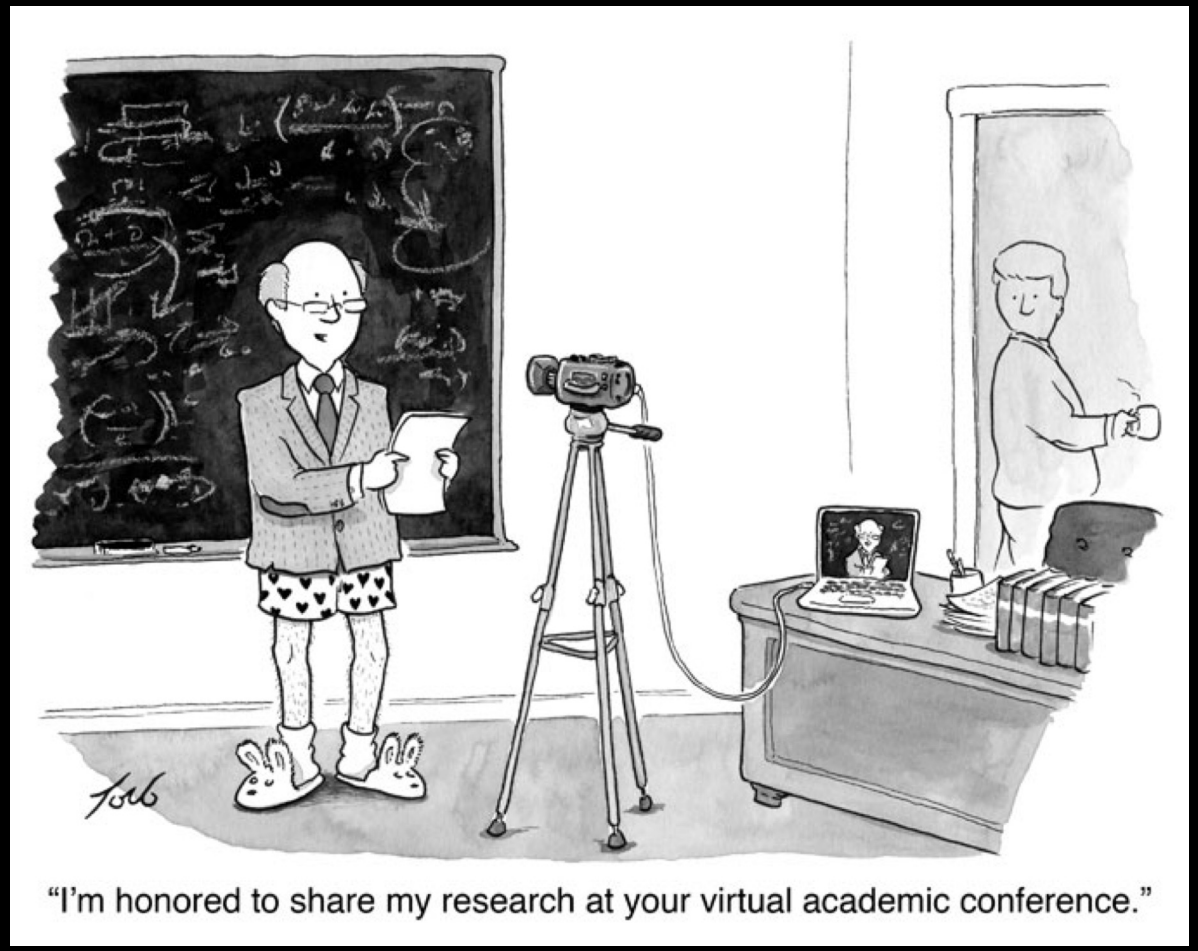
Before/After Figure

Every proposal should have one.

Show your readers an example of what they have now and next to it, an example of what they can expect to get if they fund your proposal.

You can make this comparison in one panel, with different coloured lines or symbols.

Conferences



The presentation style depends on

Kind of presentation: lecture? invited colloquium? short talk? public talk?

Audience: specialists in your field? astronomers in general? students? general public? native speakers?

Know thy Audience!

One needs to change **content**, **language** and **style** according to audiences

Effective communication is mind-reading, you need to know your audience

- what are their concerns?
- what do they know already?
- what do they think they know?
- do they have preconceptions?

In all communication, and especially when talking

Don’t start by explaining your research or what you have discovered.

Start with something your audience will be interested in! Something relevant to them that will capture their attention.

→ Curiosity (hooks the mind)

→ Emotions (hooks the heart)

Never start with an outline of your talk!

Tell them why they should care

Everybody like people who are positive and enthusiast

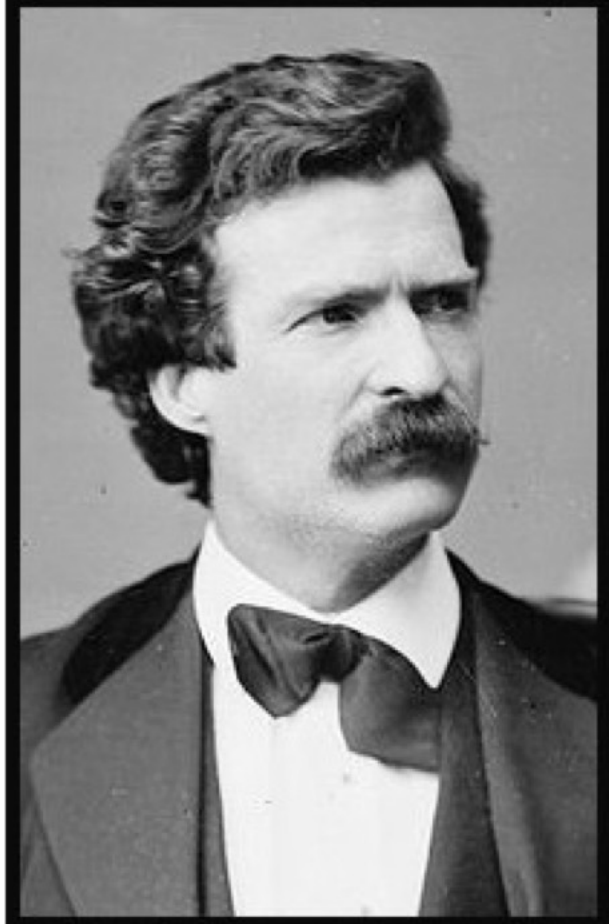
At the beginning of your presentation, a smile on your face makes a difference

During the talk, be energetic and enthusiast

Authentic passion is one of the secrets
of an excellent talk

Stage fright

Practice, Practice, Practice

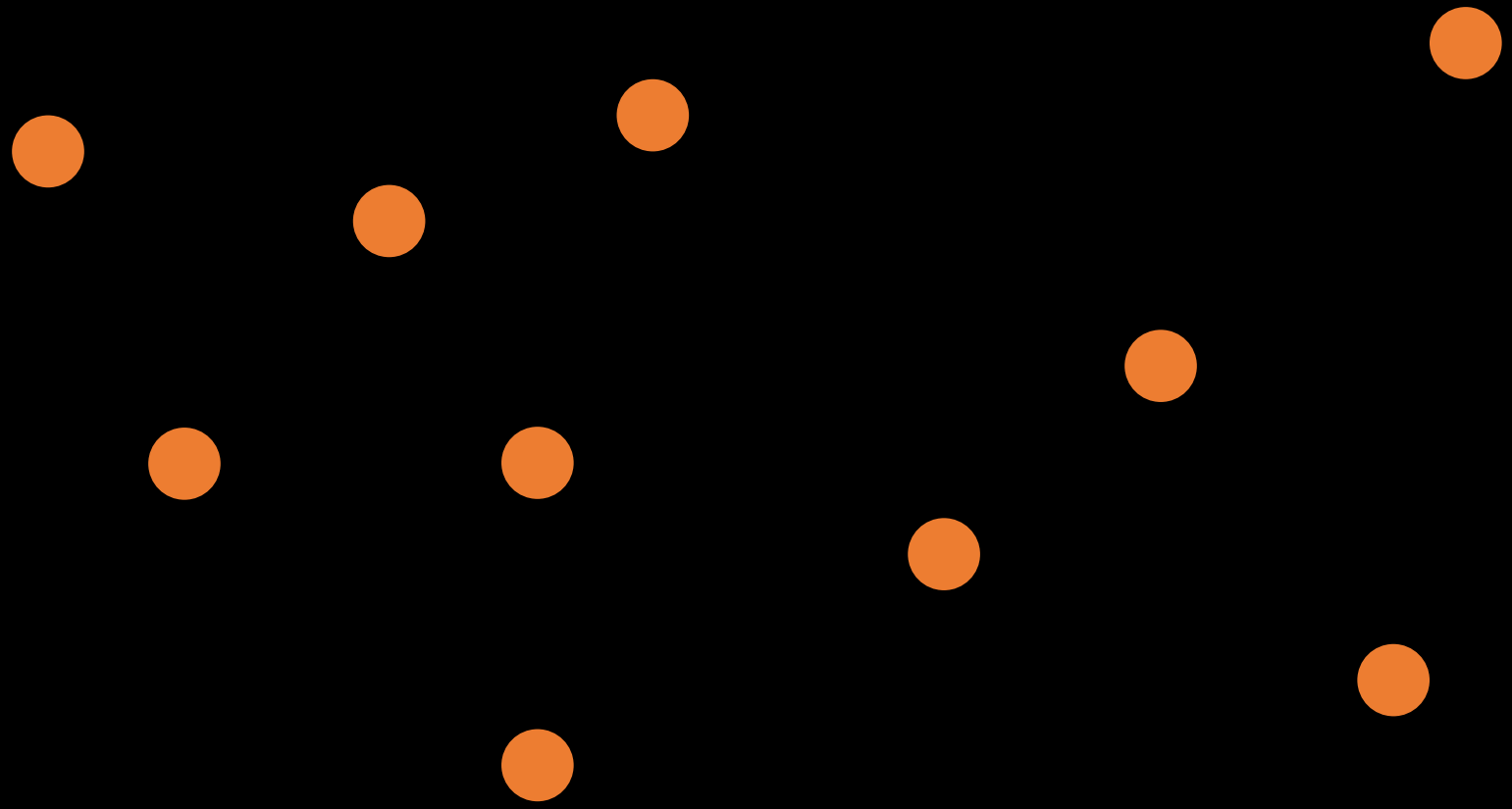


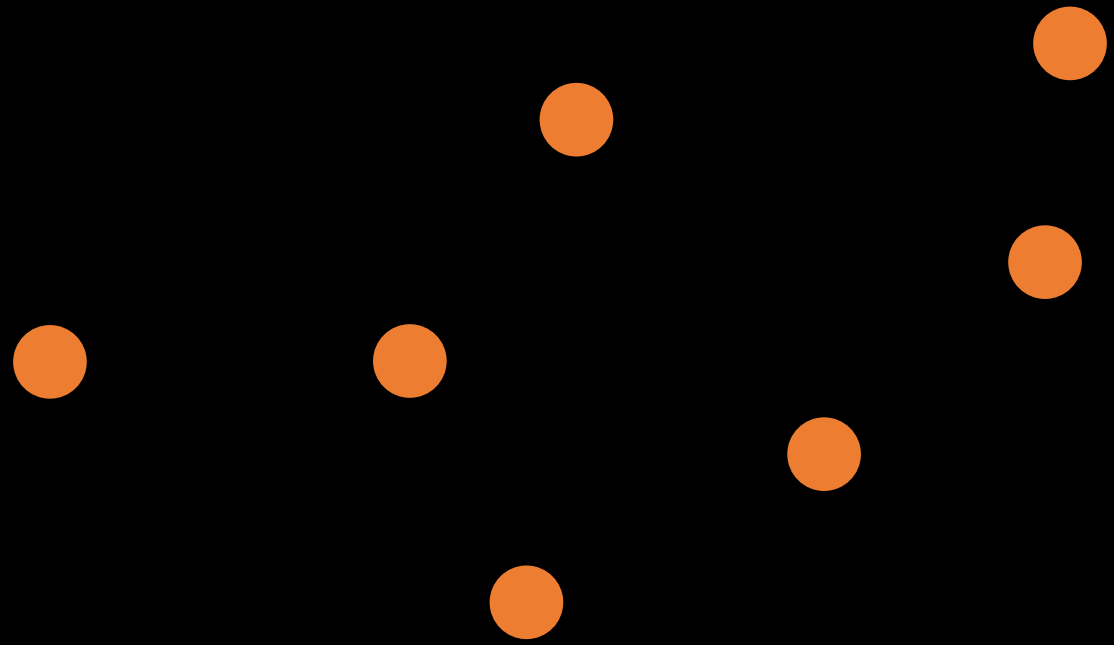
It usually takes me more than three weeks to prepare a good impromptu speech.

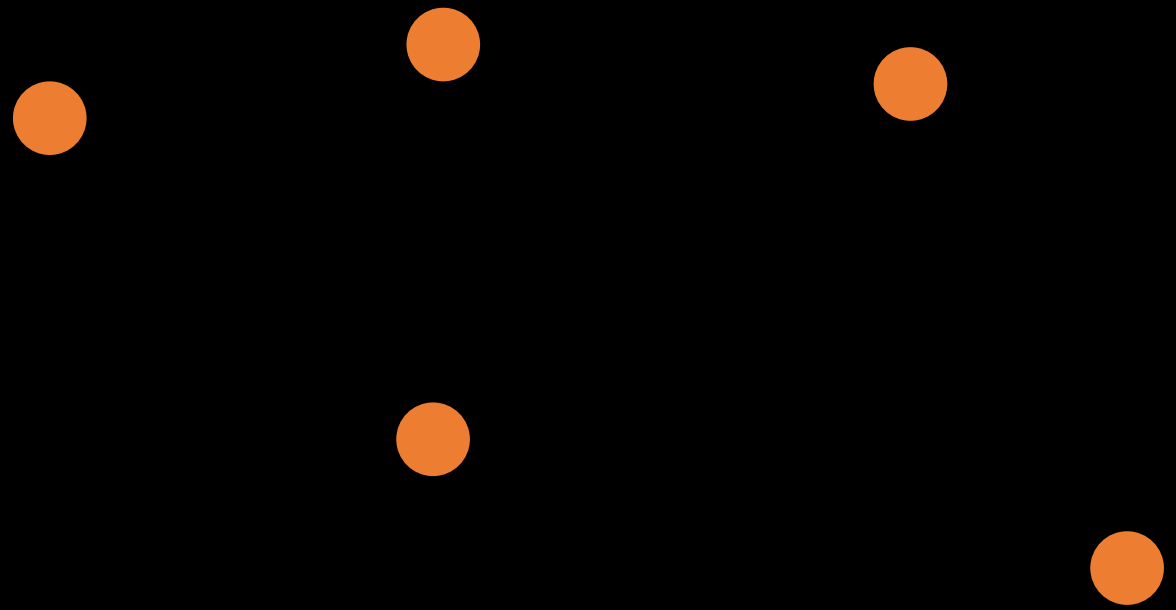
(Mark Twain)

izquotes.com

An experiment







6

Minimal Web Marketing Strategy for the Busy Student/Postdoc

- Create an email signature
- Youtube: post your videos
- Update the Wikipedia article that's about your research
- Linked-In: make a profile
- Make a research website

M. Kunchner

Web site

- Contact Information
- CV, with your photo
- List of publications with links to papers (+lay summary or visual abstracts)
- Images and Videos

Web site

Give Away Freebies

Slides of your talks (! ©)
Catalogues
Figures
Codes, including codes to make figures or to access catalogues
Links to observatories, supercomputers, …

“Science is like a parachute: if it is not open, it won’t save you!”

You’ll also gain recognition and sympathy

Communicate with the public

Press releases

Giving talks

Participate to fairs

Same is true in Europe, cf. Eurobarometers

So, be sure to know what your audience knows before engaging with them

And choose your words carefully

Talking with public/media

Come up with sound bites

"Looking at the data for the first time was one of those 'Wow!' moments that happen only once or twice in an astronomer's lifetime," says Giacomo Beccari.

Talking with public/media

Metaphors

1 microarcsecond corresponds to viewing the shape of a golf ball at more than 8,000 km distance.

Don’t say “13.7%”... say “one out of seven”.

6W

Who? What? Where? When? Why? How?
Any good news story provides answers to each of these questions.

When writing a press release or talking to the media, make sure to provide these answers.

Take-aways

Your success as a scientist will depend on how you write and talk

Learn from others – read and collect

Invent a new word

Tell a story

Proposals should contain 3 kinds of figures

Know your audience and adapt to it

Practice

Have a web site

Communicate with the public

Feel free to contact me should have questions or if you want me to come to your university/organisation to give the entire 10h course

hboffin@eso.org