

Writing  
better

# Caveats

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- I am *not* an authority.

# The objective

*... perfection is finally attained not when there is no longer anything to add, but when there is no longer anything to take away, ...*

Antoine de Saint Exupéry

# Resources

- *Strunk & White's Elements of Style* (Library / Web)
- *The Economist Style Guide* (Web via library)
- Writing in the Sciences (Coursera)
- Writing Clearly and Concisely (PGR dev.)

# Orwell's six rules

- Never use a metaphor, simile or other figure of speech which you are used to seeing in print.
- Never use a long word where a short one will do.
- If it is possible to cut out a word, always cut it out.
- Never use the passive where you can use the active.
- Never use a foreign phrase, a scientific word or a jargon word if you can think of an everyday English equivalent.
- Break any of these rules sooner than say anything outright barbarous.

# From *Elementary Rules of Composition*

- Make each paragraph a unit of thought.  
Start each with a topic or transition sentence.
- Avoid adverbs of degree (e.g. “very”). Rather quantify.
- Try to vary sentence length.
- Be positive: replace *not X* with *X's opposite*.

# Paragraphs as the unit of thought

The problem: how did high-redshift supermassive black holes form?

A potential solution: quasi-stars.

Quasi-stars can be modelled with stellar evolution codes.



# Paragraphs as the unit of thought

Over the last decade, high-redshift surveys have detected bright quasars at redshifts  $z > 6$ . Such observations imply that black holes (BHs) of more than a billion solar masses were present less than a billion years after the Big Bang. A simple open question remains: how did these objects become so massive so quickly? Despite a large and growing body of investigation into the problem, no clear solution has yet been found.

Begelman, Volonteri & Rees (2006) proposed that the direct collapse of baryonic gas in a massive dark matter halo can lead to an isolated structure comprising an initially stellar-mass BH embedded in a hydrostatic envelope. Such structures were dubbed *quasi-stars*. At the centre of a quasi-star, a BH can grow faster than its own Eddington-limited rate. Quasi-stars can thus leave massive BH remnants that subsequently grow into the supermassive BHs that power high-redshift quasars.

The structure of the gas around the BH is expected to obey the same equations as the envelopes of supergiant stars. In both cases, hydrostatic material surrounds a dense core. Giant envelopes are supported by radiation from nuclear reactions in or around the core whereas quasi-star envelopes are supported by radiation from accretion on to the BH. By choosing suitable interior conditions to describe the interaction of the BH and the envelope, it is possible to model a quasi-star with software packages designed to calculate stellar structure and evolution. Such an undertaking was the initial aim of the work described in this dissertation and the results ultimately shed new light on the structure of giant stars.

# Correctness

- Spelling and grammar!
- Numbers must agree (e.g. “the central region of the galaxies”)
- Avoid semicolons (unless you really know what you’re doing)
- Use jargon correctly (e.g. “complex function”, “exponential growth”)
- Avoid metaphors or be sure to use them correctly  
(e.g. Rosetta stone, keystone vs cornerstone)

# Use fewer and shorter words

demonstrate		show
the majority of	vs	most
utilise		use

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demonstrate		show
the majority of	vs	most
utilise		use

in order to		to
whether or not	vs	whether
by means of		by

# Find verbs that have been relegated

performed analysis	vs	analysed
places constraints on		constrains
carry out simulations		simulate
is dominant		dominates

# Short examples

- Atomic hydrogen cooling is only effective ...
- This will be of increasing importance for ...
- This results in a change of the global properties ...

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# Longer examples

- The formation of a giant planet is the result of the presence of a gravitational instability...

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- The formation of a giant planet is the result of the presence of a gravitational instability... (16 words)
- A giant planet forms because of a gravitational instability... (9 words)

# Longer examples

- It is to be anticipated that the asteroseismically-calibrated stellar models will be highly beneficial for various fields of research in astronomy and in computational physics in general.

# Longer examples

- It is to be anticipated that the asteroseismically-calibrated stellar models will be highly beneficial for various fields of research in astronomy and in computational physics in general. (28 words)
- The asteroseismically-calibrated stellar models will benefit various fields of astronomy and computational physics. (14 words)

# Longer examples

- Finally, despite the relevant contributions of the present study towards minimizing the frequency of background false positives in the P5 sample, a particular concern might still arise with regard the potential difficulties in properly identifying, based on the light curves alone, the false positives from the P5 detections.

# Longer examples

- Finally, despite the relevant contributions of the present study towards minimizing the frequency of background false positives in the P5 sample, a particular concern might still arise with regard the potential difficulties in properly identifying, based on the light curves alone, the false positives from the P5 detections. (48 words)
- Finally, although our methods detect fewer false positives, it might still be difficult to identify false positives among the P5 detections from light curves alone. (25 words)

# Some tools and methods

- Find the verb in each sentence
  - Is it something weak, perhaps concealing something stronger in a noun? (e.g. *is dominant* vs *dominates*)
- Reverse outlining
  - What does each paragraph say?
  - What did you want it to say?
- [languagecheck](#)



# Parting thoughts

Editing takes time.

The first draft won't be perfect.

*“I would have written a shorter letter, but I did not have the time.”*

Blaise Pascal