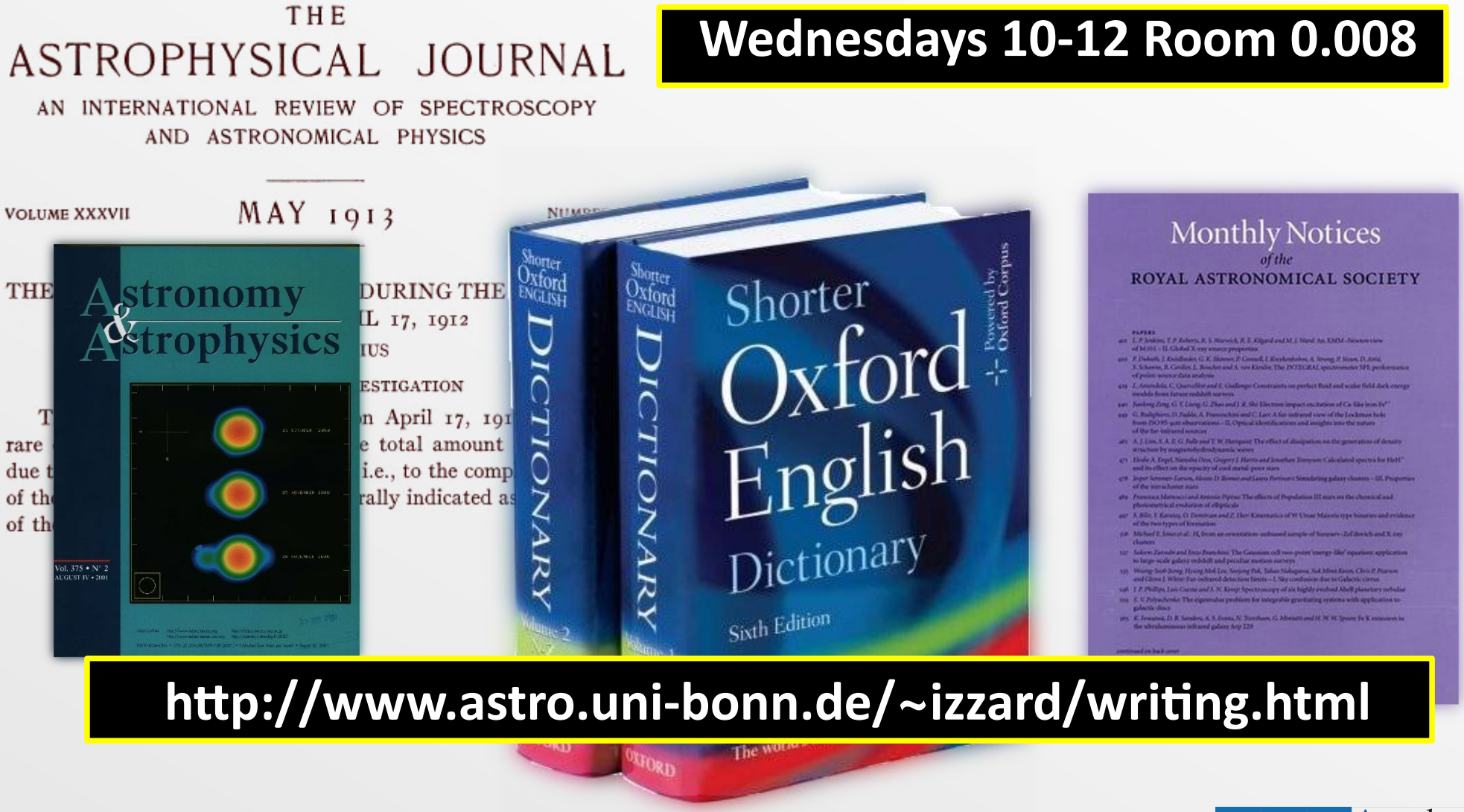
Scientific Writing 6951

Wednesdays 10-12 Room 0.008



http://www.astro.uni-bonn.de/~izzard/writing.html

Argelander Institut für Astronomie

Welcome to *Scientific Writing*

- Classes weekly all semester from today
- Each class is approximately **90** minutes
  - Some time for ***learning****:* about half an hour
  - More time for ***doing****:* around an hour
  - Work in small groups (***three***?)
  - Interact : with each other and us!
- *Sometimes* a little homework (reading takes time)

Before I forget

- Please email me so I can make a list of email addresses

izzard@astro.uni-bonn.de

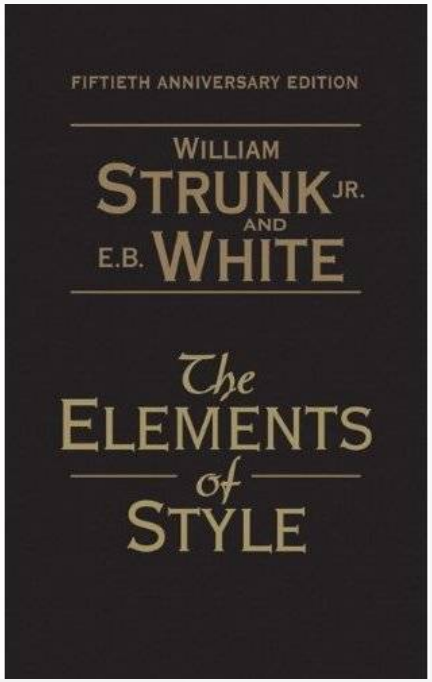
Today – while you remember!

Thanks!

Course Resources: Books 1

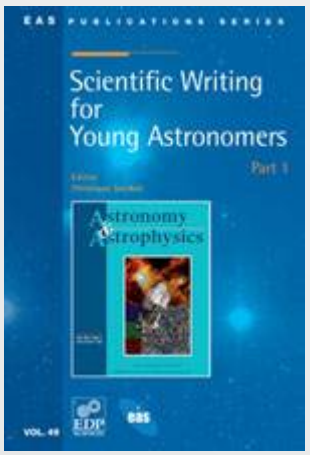
The Elements of Style

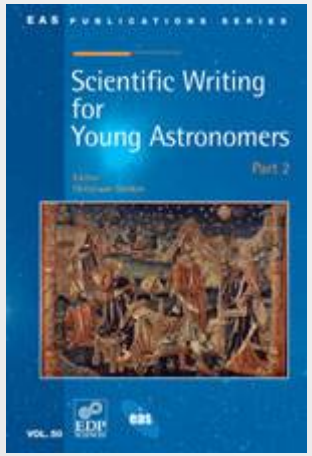
Strunk and White



www.gutenberg.org/ebooks/37134

home.ccil.org/~cowan/style-revised.html





Scientific Writing for Young Astronomers

http://www.swya.org/

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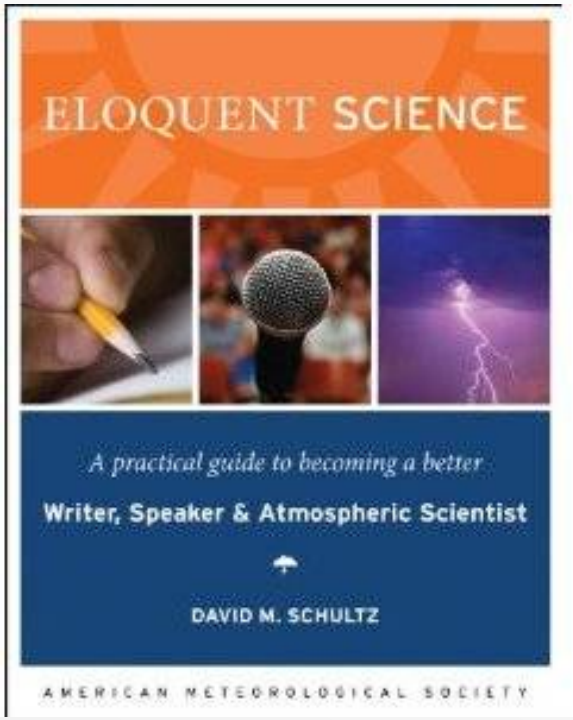
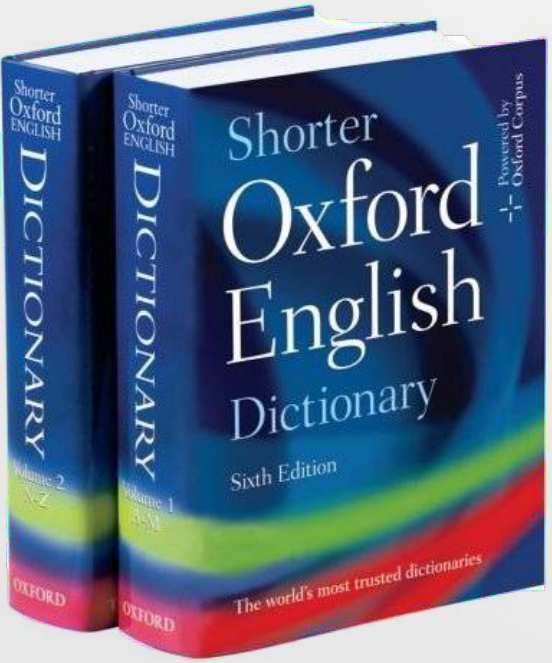
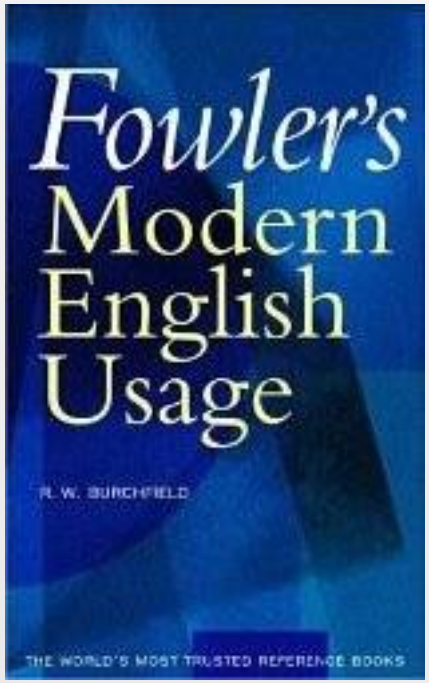
Course Resources: Books 2

Eloquent Science

Schultz







Oxford English Dictionary and

Fowler's

Modern English Usage

Course Resources: Web

http://www.astro.uni-bonn.de/~izzard/writing.html

We will update the website with:

- Slides
- Exercises
- Useful information

  BUT you are quite capable of searching for resources yourself!

  This is the 21st century and the internet is your friend . . .

Course Resources: Humans

Robert Izzard

Frank Bertoldi

There are no stupid questions!

Course Resources: *You*

Please ask questions!

Why learn to write well?

If you want to be a scientist:

You have to write a thesis and publish papers!

"**START > DO > FINISH > PUBLISH**"

Why?

To **communicate** with others: scientists or not.

Survey of engineers:

- 24% of time spent writing
  - 31% of time spent working with written material

Richard M. Davis, *Technical Writing: Its Importance in the Engineering Profession and Its Place in the Engineering Curriculum*, AFIT TR 75-5 (Wright-Patterson AFB, Ohio: Wright-Patterson Air Force Base, 1975).

Why learn to write well?

Space shuttle ***Challenger***

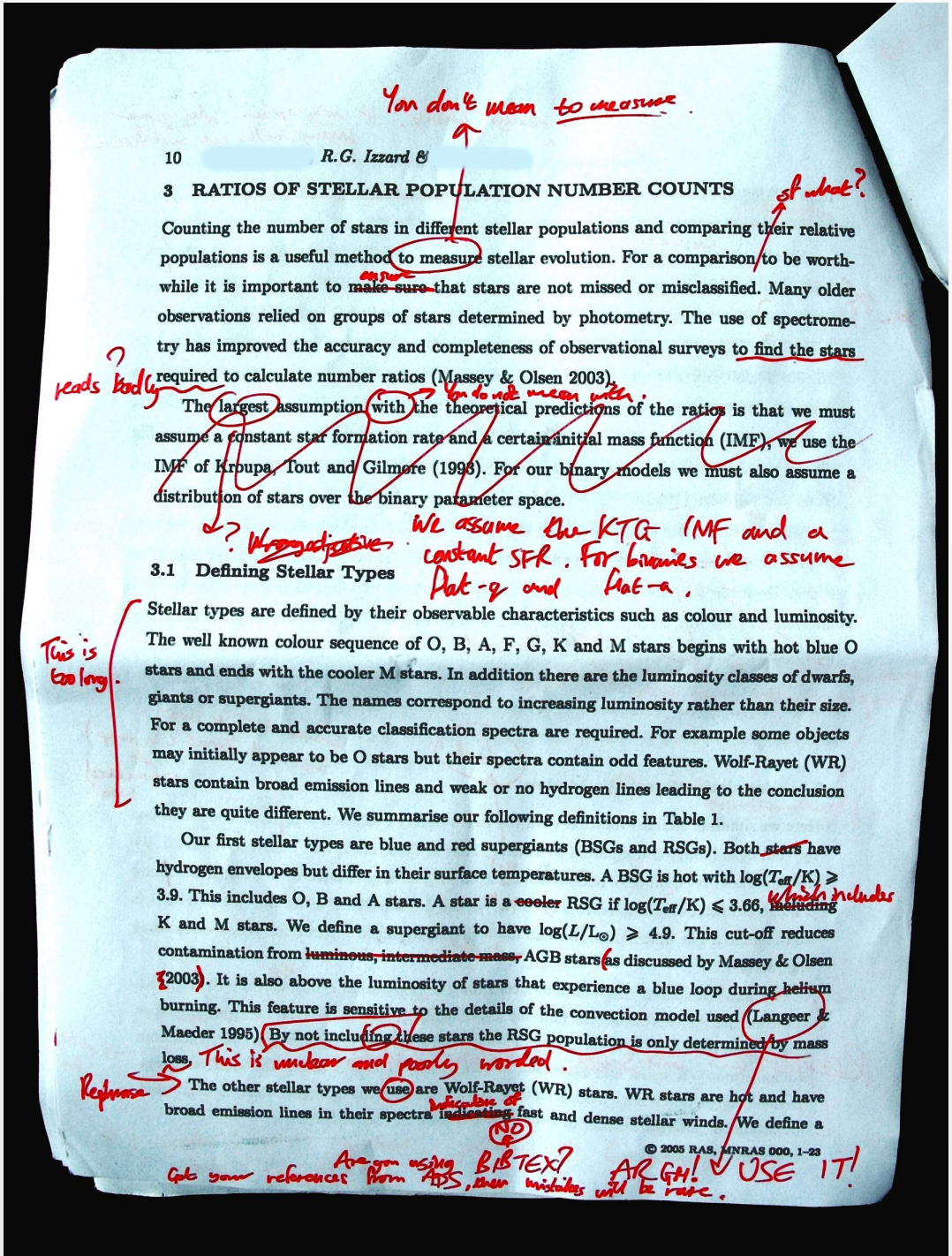
"Thus the engineers, who were very concerned since they knew the consequences of <*the failure mechanism*>, did not present the data in a way that showed the trends or that could be explained to a sceptical senior NASA manager. They thought they were communicating but missed one of the fundamental rules of good communication which is to express your position in a way that your customer can understand."

Prof. Daniel Hastings, MIT Engineering Systems Division

See also: Feynman, Richard P. "An Outsider's Inside View of the Challenger Inquiry." Physics Today 41(February 1988): 26-37.

Why learn to write well?

Avoid nasty editing! (and editors!)



10 R.G. Izzard &

3 RATIOS OF STELLAR POPULATION NUMBER COUNTS

Counting the number of stars in different stellar populations and comparing their relative populations is a useful method to measure stellar evolution. For a comparison to be worthwhile it is important to make sure that stars are not missed or misclassified. Many older observations relied on groups of stars determined by photometry. The use of spectrometry has improved the accuracy and completeness of observational surveys to find the stars required to calculate number ratios (Massey & Olsen 2003).

The largest assumption with the theoretical predictions of the ratios is that we must assume a constant star formation rate and a certain initial mass function (IMF), we use the IMF of Kroupa, Tout and Gilmore (1993). For our binary models we must also assume a distribution of stars over the binary parameter space.

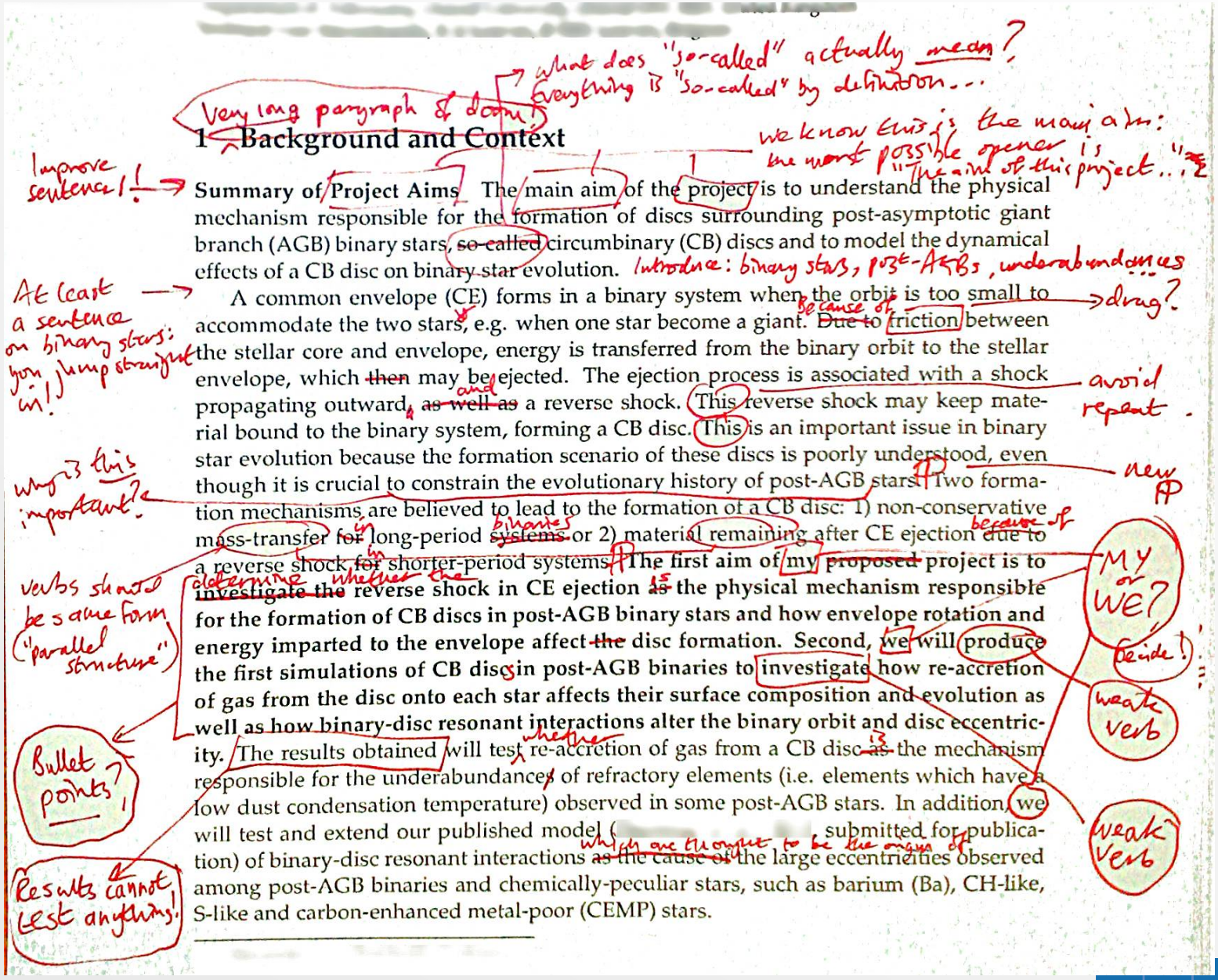
3.1 Defining Stellar Types

Stellar types are defined by their observable characteristics such as colour and luminosity. The well known colour sequence of O, B, A, F, G, K and M stars begins with hot blue O stars and ends with the cooler M stars. In addition there are the luminosity classes of dwarfs, giants or supergiants. The names correspond to increasing luminosity rather than their size. For a complete and accurate classification spectra are required. For example some objects may initially appear to be O stars but their spectra contain odd features. Wolf-Rayet (WR) stars contain broad emission lines and weak or no hydrogen lines leading to the conclusion they are quite different. We summarise our following definitions in Table 1.

Our first stellar types are blue and red supergiants (BSGs and RSGs). Both stars have hydrogen envelopes but differ in their surface temperatures. A BSG is hot with $\log(T_{\rm eff}/{\rm K}) \geqslant 3.9$. This includes O, B and A stars. A star is a cooler RSG if $\log(T_{\rm eff}/{\rm K}) \leqslant 3.66$, including K and M stars. We define a supergiant to have $\log(L/{\rm L}_\odot) \geqslant 4.9$. This cut-off reduces contamination from luminous, intermediate mass, AGB stars (as discussed by Massey & Olsen 2003). It is also above the luminosity of stars that experience a blue loop during helium burning. This feature is sensitive to the details of the convection model used (Langeer & Maeder 1995). By not including these stars the RSG population is only determined by mass loss.

The other stellar types we use are Wolf-Rayet (WR) stars. WR stars are hot and have broad emission lines in their spectra indicating fast and dense stellar winds. We define a

Avoid bloodshed!



1 Background and Context

Summary of Project Aims The main aim of the project is to understand the physical mechanism responsible for the formation of discs surrounding post-asymptotic giant branch (AGB) binary stars, so-called circumbinary (CB) discs and to model the dynamical effects of a CB disc on binary star evolution.

A common envelope (CE) forms in a binary system when the orbit is too small to accommodate the two stars, e.g. when one star become a giant. Due to friction between the stellar core and envelope, energy is transferred from the binary orbit to the stellar envelope, which then may be ejected. The ejection process is associated with a shock propagating outward, as well as a reverse shock. This reverse shock may keep material bound to the binary system, forming a CB disc. This is an important issue in binary star evolution because the formation scenario of these discs is poorly understood, even though it is crucial to constrain the evolutionary history of post-AGB stars. Two formation mechanisms are believed to lead to the formation of a CB disc: 1) non-conservative mass-transfer for long-period systems or 2) material remaining after CE ejection due to a reverse shock for shorter-period systems. **The first aim of my proposed project is to investigate the reverse shock in CE ejection as the physical mechanism responsible for the formation of CB discs in post-AGB binary stars and how envelope rotation and energy imparted to the envelope affect the disc formation. Second, we will produce the first simulations of CB discs in post-AGB binaries to investigate how re-accretion of gas from the disc onto each star affects their surface composition and evolution as well as how binary-disc resonant interactions alter the binary orbit and disc eccentricity.** The results obtained will test re-accretion of gas from a CB disc as the mechanism responsible for the underabundances of refractory elements (i.e. elements which have a low dust condensation temperature) observed in some post-AGB stars. In addition, we will test and extend our published model (, submitted for publication) of binary-disc resonant interactions as the cause of the large eccentricities observed among post-AGB binaries and chemically-peculiar stars, such as barium (Ba), CH-like, S-like and carbon-enhanced metal-poor (CEMP) stars.

Why learn to write well?

Enjoyable pastime!

How you communicate affects others.
Be considerate!

I spend **(>?)** 25% of my time proof-reading …

I would prefer to spend that time doing research!

For you:

*Writing is an **essential** part of **research**.*

How lucky you are...

How lucky you are...

Literature is difficult!

You do **NOT** have to learn to write literature!

Why now?

Your immediate concern:

Thesis (or papers) to write by a deadline

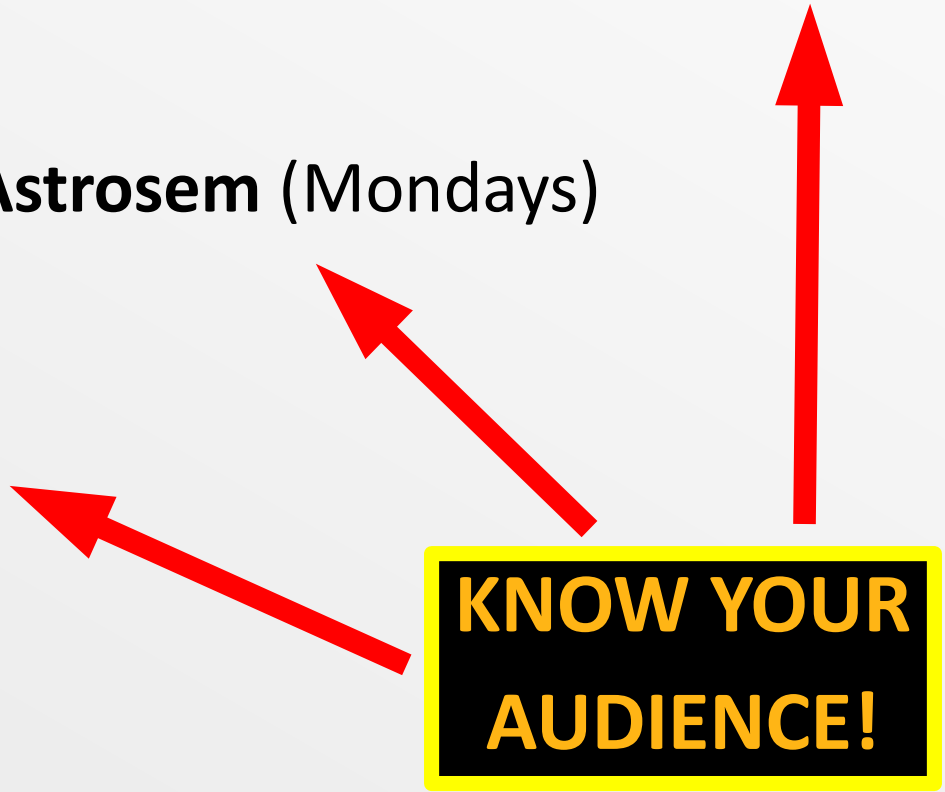
Also:

Talk(s) to give – **Astrosem** (Mondays)

Group **meetings**

And

Assignments!



Scientific Writing

Scientific writing

- Is ***not literature***: no more difficult than “research”!
- Often has a specialist readership
- Includes
  - Description of research
  - Interpretation and significance
- Must be **CLEAR**, **PRECISE** and **CONCISE**
- Bad style and/or language skills **KILL** your paper!

Be clear

Do not force your reader to guess what you mean

- Present ***logical arguments*** convincingly
- Your job is to **inform** and **educate** the reader
- Good **style** helps
- Good **English** helps too

Be precise

There is no room for **ambiguity**!

> "For our binary models we must also assume a distribution of stars over the binary parameter space."

Better:

> "For binary stars we assume a flat-*q* distribution for mass ratios and a flat-ln*a* distribution for separations."

- Be careful with technical words e.g.
- "The Sun weighs 10^{33} g."
- Communicate *exactly* what you mean*!*

Be concise

Use as few words as possible but as many as you need

Original:

"The largest assumption with the theoretical predictions of the ratios is that we must assume a constant star formation rate and a certain initial mass function (IMF), we use the IMF of Kroupa, Tout and Gilmore (1993)."

My version:

"We assume the Kroupa, Tout and Gilmore (1993) initial mass function and a constant star formation rate."

- You are **NOT** paid by the number of words you write!
- Learning how to edit will help! (Classes 11, 12)

Scientific Writing

To do:

- Reading articles (Class 2, 3)
- Preparation and planning (Classes 4, 7)
- Writing (Classes 3, 5) and drawing (Class 6)
- English language style (Classes 8-10)
- Editing (Classes 11, 12)
- Criticism, peer review (Class 11)
- Also: Remember to **read**, do the ***Astrosem***
- *There is no exam, neither will you receive credit points*

Thinking and Writing

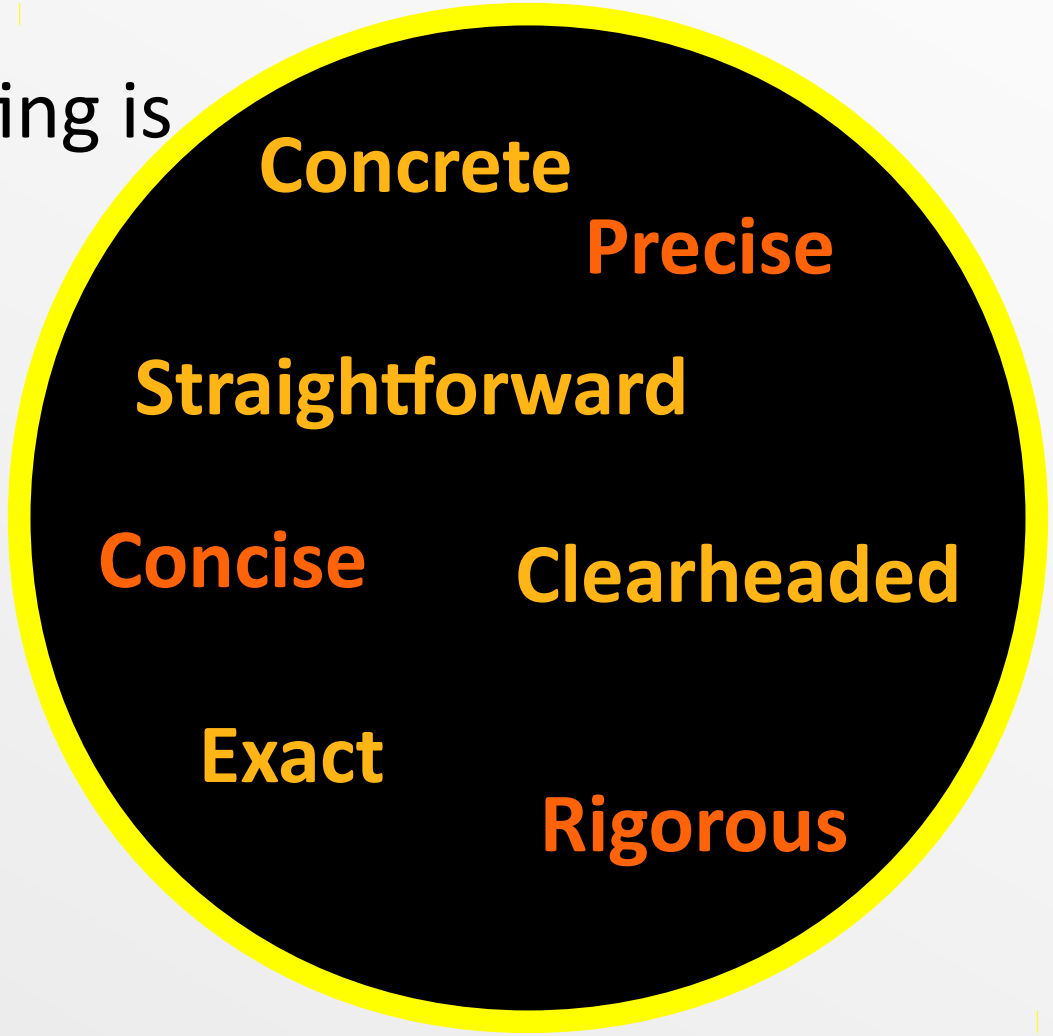
Writing and thinking well use the same skills

You can already **think** – otherwise you would

not be here. So... **writing** is the next step.

Summary

Scientific writing is



These are the qualities associated with scientists!

i.e. ***YOU***!

Exercise 1

List the kinds of writing a **scientist** is required to produce

and *for whom* …

Exercise 1

Answers include:

Dissertations, progress reports, laboratory journal, journal papers, conference proceedings, case histories (in medicine), review articles, product/book reviews, project proposals, grant applications, popular science articles, minutes (protocol), (lecture) notes, handouts, press releases, tweets, (code) documentation, instructions, letters, questionnaires, CVs, observing proposals, posters, emails, critiques, referee reports, exams . . .

Related: oral presentations (talks), radio/TV shows, vod/podcasts, interviews . . .

Exercise 2

Please fill in the **questionnaire**!

Homework Exercise

Find the websites of ApJ, A&A and MNRAS

(hint: Google !)

Choose an article from their latest edition:

About something that *interests* you!

In what order did you read the article?

(e.g. Title, Abstract, Figure 1, Introduction,Table 1, Method, …)

Email me the answer over the weekend

izzard@astro.uni-bonn.de

We shall discuss the results

of your “survey” next week . . .