

Taken from
“Scientific writing and Communication”

Papers, proposals and presentations

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OUP, 2017, 3rd Edition

Why communicate?

- “Without clear communication, even the best results in science mean little” Hofmann 2017
- “Communication is an integral part of the research you perform as a scientist.” SciTable
- Convey a message (the *so what*), not just information (the *what*). SciTable
- Fact-based and objective, not creative!

Where it matters

- Original scientific research articles
 - To inform other scientists about your work
 - To explain your work to the public
- Review articles – overview and interpretation
- Grant proposals – to apply for research funding
- Posters and oral presentations – to publicise your work
- Job applications

What is scientific writing?

- Fact-based and objective, not creative!
- NOT same as “Science writing”, which is for general public audience

What's important

- “Convey a message (the *so what*), not just information (the *what*).” SciTable
- “Write or speak in a simple, straightforward way.”
SciTable
 - Your audience is by definition less aware of what you want to communicate than you are, clarity is important.
 - Beware of overestimating the audience's knowledge of your topic or field, but respect their intelligence, don't oversimplify.
- Being Ethical

Being Ethical!

- Science relies upon building up a body of TRUTH - very important
- Accuracy
 - avoid falsification, fabrication or misrepresentation of data, fraud, etc,
- Mutual respect, fairness and trust
 - Makes collaboration work, protects IP, allows authorship recognition
- Hold scientists accountable
 - avoid research misconduct, plagiarism, harm

Who are your audience?

- When you communicate, your purpose is not what *you* want to do; instead, it is what you want *your audience* to do as a result of reading what you wrote or listening to what you said.
- To communicate effectively (that is, to achieve your purpose), you must adapt to your audience. Therefore, you must know your audience.

<https://www.nature.com/scitable/topicpage/audience-and-purpose-13952663>

Thinking about the audience

- Who is the audience?
- Why have they read your article/come to listen to you?
 - Focus on what your audience wants to learn, not on what you feel like telling them.
- What do they already know – are they specialists or non specialists? How specialist?
 - Try not to exclude readers. A well-written scientific paper makes sense to anyone with a scientific background.
 - Provide context

Who is likely to read your work?

- Reviewers
- Editors
- Students
- Established scientists
- Scientists from another discipline
- Scientists for whom English is not a mother tongue

Words

- Use **precise** words, eg.
 - Instead of “several” say how many
 - Instead of “often” or “frequently”, say how often
 - be **quantitative**
- Use **simple** words whenever possible.
 - Complexity confuses and doesn't make you look clever

Simplify: example 2

- “There is a large body of experimental evidence that clearly shows that members of the genus *Crotalus** congregate simultaneously in cases of prolonged decreased temperature conditions in the later part of the year.”
- Rattlesnakes come together when it gets cold in the winter
- * the genus *Crotalus* = rattlesnakes

Other things to remember

- Avoid sexism – use “humans” rather than generic “man”, avoid assuming a particular role has an particular gender associated with it.
- Redundancies – omit anything unnecessary
- Use correct terminology to avoid misunderstandings

Words to avoid

- Basically, essentially, fairly, much, really, practically, quite, several, very, virtually, actually
- Jargon – eg. observing slang, specific to subject, will lose outsiders
- Abbreviations and Acronyms –
 - Will confuse outsiders.
 - Standard abbreviations like kg or m are fine.
 - Define lengthy terms appearing several times, on first use, e.g. SKA. Otherwise, write out in full.

Grammar

- OK to use first person – active voice more lively
- Use active voice (keep passive voice where word order requires it, or for emphasis)
- Use past tense for observations and specific conclusions
- Use present tense for general rules and established knowledge

Sentences and paragraphs

- Write short sentences, one idea per sentence.
- Use active verbs
- One message per paragraph
 - First sentence introduces topic
 - Work from general to specific,
 - Start with old information and work to new information
 - organise logically
 - Link words and ideas across sentences, either from one sentence to next, or referring back to topic sentence

Example - linked sentences

- Important substructure can be found in galaxy

haloes. Galaxy haloes vary with

galaxy type. The galaxy type most likely to contain substructure is the dwarf type. Dwarf galaxies are subject to less violent stripping processes.

Prepositions

- Compared **to** - comparing unlike things
- Compared **with** - like things
- Comparison **with** and comparison **between**
- Different **from**
- In connection **with**
- In contrast **to**
- Similar **to**
- Correlated **with**
- Analogous **to**

Stages in writing a paper

- Prewriting – decide on audience, choose journal (fixes style).
- Drafting – review literature (context)
 - Organise thoughts
 - Arrange material – general to specific
 - Write – Introduction, Observations (how and what done), Results and Discussion. Write abstract last.
- Revise – several times, and ask colleagues to help
- Edit – grammar, spelling, punctuation, etc., correct for Journal chosen.
- Submit to journal for peer review

Authorship

- Co-authors - Everyone contributing substantially to research, experimental design, analysis or writing paper
 - All co-authors should at least read the paper once!
- Order – person writing paper first, then follow institute protocol. If many authors – alphabetic order.
- Other people who contributed (eg telescope controllers, IT people) thanked in “Acknowledgments”, together with funders, grants, etc.
- Best to have one main writer to do revisions – keep consistent style

Outlining a manuscript

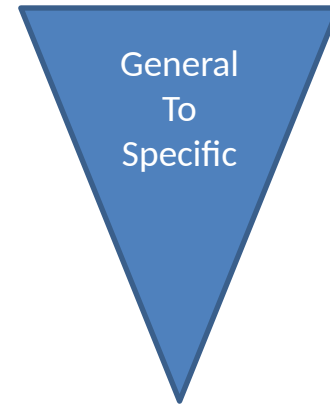
- Write down the purpose or question of your research – central focus of paper
- Organise your material
 - Well organised lab notebook
 - Data/observations
 - Figures/tables
 - Calculations/models
 - Jot down main points for each section

Components of a paper

- Title
- Abstract
- Introduction
- Method/Observations
- Results
- Discussion/calculation
- Conclusion
- Acknowledgments
- References

Introduction

- Purpose - Interest your audience and provide context
- Include:
 - Known background information
 - General
 - Specific related data
 - The problem or unknown area your paper aims to explore
 - Overall purpose of the paper/research question
 - General description of observational approach



Start writing

- Use bullet point lists to note points you want to make, ideas when reading, etc.
- Once all topics and subsections collected logically, write paragraphs around ideas
- Arrange paragraphs according to outline – logical sequence with smooth flow of ideas.
 - Logical organisation more important than grammar or spelling

References

- Any use of others ideas or writings **must** be referenced.
 - Credit to original author
 - Shows reader where to go for further study
 - Provides editors with possible referees
 - Shows how familiar you are with field
- Material may require copyright permission – e.g. diagrams, pictures
- Immediately relevant references – 20 to 40 typically. Check citation and reference lists agree
- Use a manager – e.g. Endnote Basic
 - <http://endnote.com/product-details/basic>
 - <http://www.youtube.com/user/EndNoteTraining>
- Follow the Journal style

Politeness and Plagiarism

- Remain objective and neutral when citing others work – professional and courteous
- Plagiarism
 - Quoting material without acknowledging source
 - Borrowing ideas, concepts, results, etc, and pretending they are your own
 - Summarising and paraphrasing another's work without acknowledgment
 - Also applies to text, pictures, figures, etc.
 - Plagiarism checkers exist (e.g. Turnitin)

Figures and Tables

- Place information where the reader expects to find it.
- Use as few figures as you need
- Design with visual impact – avoid clutter
- Use tables where numbers need to be precise
- Use figure captions and table headings
- Number formulae

Methods - What you did and how you did it

- Purpose: to describe observational approach
- Provide enough information for trained astronomer to repeat your work
 - What instruments/telescopes you used
 - How you carried out the observing programme, sample observed, for how long and when
 - Put any detailed descriptions, software listings, source lists etc. in appendices.
 - Provide references where needed

Results



Important to
less
important

- Core of paper. Work from most to least important.
- Report only results relevant to introduction and methods – omit peripheral information
- Refer to data in figures and tables
- Don't suppress contradictory results – may be a discovery!
- Interpret data for the reader
 - results are interpreted outcome – emphasise them

Discussion

- Answer research question
- Interpret key results
- Compare/contrast previous work
- Mention limitations, unexpected findings
- State hypotheses, models
- Summarise, analyse significance and implications

Abstract

- Makes people read your paper (or not)
- One paragraph
- Concise, informative and complete
 - State purpose/research question
 - State briefly what you did
 - State key results
 - Conclusion (answer to the question)
 - Significance

Choosing a title

- Aims: Attract readers, and stand out in field
- Clear, complete and succinct – keep it short!
- Main topic of your study

- Keywords

Revising a paper

- Put paper aside at least overnight
- Check content and flow are logical
- Then revise for style
- Condense where possible
- Expect several revisions (>6?)
- Get co-authors to read paper
- Ask for and expect to get constructive criticism

Journal submission and Peer review

- Final version – neat, professional, complete, follows *Instructions to Authors*
- Submit to one journal at a time
- Include a cover letter – why research is novel and belongs in this journal
- Editor sends to reviewers, who comment
- Accept, accept with revisions, or reject
- Be courteous and professional!

Mastering scientific writing

- Use the rules and guidelines
- Notice how professional scientists write
- Practice! Lots!
- Critique each other's work

English Communication for Scientists

<https://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993/contents>

- Unit 1
 - [Communicating as a Scientist](#)
- Unit 2
 - [Writing Scientific Papers](#)
- Unit 3
 - [Writing Correspondence](#)
- Unit 4
 - [Giving Oral Presentations](#)
- Unit 5
 - [Interacting During Conference Sessions](#)
- Unit 6
 - [Communicating in the Classroom](#)

Misused words

- Suffixes ability, -ization, ize/ized/izing, -ology
- Verbs like make (be precise)
- Affect (verb) and effect (noun)
- Since (temporal), because (cause and effect)
- Which (non essential clause), that (essential information)

Phrases to avoid

EMPTY PHRASE	EQUIVALENT
a majority of	most
a number of	many
accounted for by the fact that	because
as a consequence of	because
in view of the fact that	because
for the reason that	because
on account of	because
on the basis of	because
owing to the fact that	because
an order of magnitude	ten times
are of the same opinion	agree
at the present (moment)	now
at this point in time	now
by means of	by, with
despite the fact that	although
during the course of	during, while
fewer in number	fewer
for the purpose of	for

EMPTY PHRASE	EQUIVALENT
has the capability of	can
having regard to	about
if conditions are such that	if
in all cases	always, invariably
in close proximity to	near
in connection with	about, concerning
in my opinion it is not an unjustifiable assumption that	I think
in order to	to
in the event that	if
it is clear that	clearly
it is often the case that	often
it is possible that the cause is	the cause may be
it is worth pointing out that	note that
it may, however, be noted that	but
lacked the ability to	could not
large numbers of	many
prior to	before