

Scientific writing in English

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English

English is the ultimate *lingua franca*

English has
between 400,000 (in the dictionary) and 600,000 words (an estimate)

French about 150,000 and Russian about 130,000 (in the dictionary)

Learning to write well is like learning to swim, drive a car, or play the piano.

Improvement is unlikely to result from reading about how the activity is to be done.

Shaughnessy & Zechmeister, 1990, p.425

Effective writing

Structure

How to start (and finish)

Fine points

Writing structure

Title

Introduction

Main body

- Material and methods
- Results
- Discussion

Conclusions

Acknowledgements

References

Title

- It should contain most key words

- It should NOT start with a weak word
(Effects of..., Influence of..., Contribution to...)

~~Effect of flooding on pH of rice-producing, acid-sulphate soils in NSW~~

Flooding alters pH of rice-producing, acid-sulphate soils in New South Wales

- It should hint at the main findings, or conclusions, or both

Flooding increases pH of rice-producing, acid-sulphate soils in New South Wales

Introduction

Appropriate background information:

- 1) general
- 2) specific

What is that I want to do and where it fits?

Terminology defined and explained, if necessary

What am I talking about?

Your research explained in terms of scientific relevance

Why is it important to do this research?

Aims and limitations

This is what I aim to achieve.

Or: hypothesis to be tested in the research

This is what I want to test.

Material and methods

What did I do and how?

describe the material

describe procedures, methods and equipment used

Follow the time line of your work

Results

What did I find out?

Sort out what is important and give it prominence

Find out what is less important and leave it out

Organise your data in tables or graphs as appropriate

Include relevant statistical information

Discussion

So, what does it all mean?

Sort out what is important and give it prominence

Find out what is less important and do not mention it

Use separate paragraphs for each complete argument in discussion

Clear interpretation (NOT REPETITION) of results and their significance

Comparison with previously published results

Relevance of results to practice

(how will the world be different because of what you found out?)

Conclusions

Short version

What is important to remember (take-home message)
(1 to max 2 sentences)

Future work based on your results (1 sentence)

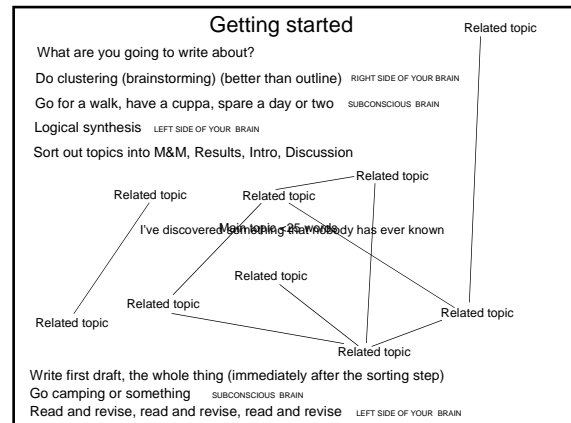
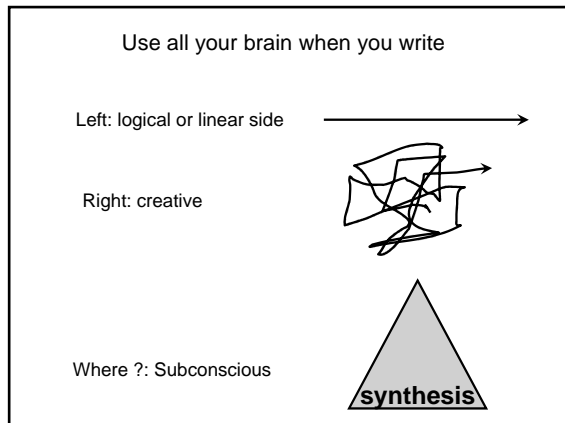
How to start writing

... and in between ...

How to finish

A thousand-mile journey starts with the first step.

Chinese proverb



Revise your paper several times

Read your paper aloud

Reading aloud forces you OUT of the writer mode and INTO the reader mode.

Ask someone else to read your paper.

During revising, keep asking yourself questions of substance

Am I including appropriate information?

What am I trying to say?

Do I need to expand on this point?

Will this be clear to the reader?

During revising, keep asking yourself questions of style

Are any paragraphs out of order?

Are any sentences within a paragraph out of order?

Is there some wording that can be improved?

Are sentences too long and wordy?

Write an abstract

Read the paper and jot down the important points LEFT SIDE OF YOUR BRAIN

Condense these points into the abstract without much thought RIGHT SIDE OF YOUR BRAIN

Revise LEFT SIDE OF YOUR BRAIN

Write a title by choosing key words from the Abstract

Give yourself a pat on the back if you can reach it

Little things in writing that make **big** difference

Words are powerful weapons;
use them wisely, use them sparingly.

The four C's of writing

- **Clear**
- **Concise**
- **Correct**
- **Complete**

Topics covered

- Keep it simple
- Cumbersome constructions
- Unnecessary words and phrases
- Passive and active voice
- Make it short
- Affect, effect
- Between, among
- Both, either
- Compare with, compare to
- Respectively
- Since, because
- That, which
- While, whereas
- Singular, plural
- Noun and verb agreeing in number
- Word order
- Finish your comparisons
- Punctuation
- Spelling
- Be accurate!
- Effective tables and graphs

Keep it simple

Owing to the complexity of their subject matter, scientists have ample reason to be cognizant of their readership and, to a greater order of magnitude than other authors, to therefore conscientiously construct sentences that eschew unnecessarily long and complicated words.

Two other ways to deliver the message from the paragraph above:

- 1) Keep it simple. Avoid complicated words if you can.
- 2) Use the long words you *need*, but avoid those you *do not need*.

Keep it simple

Small words are powerful.

President John F. Kennedy said in his inaugural address:
"Ask not what your country can do for you, ask what you can do for your country."

The only word with two syllables is *country*. Other words have one syllable apiece.

I would say:

"Ask not what your science can do for you, ask what you can do for your science."

Cumbersome constructions

Do not use long paragraphs

The SV channels are regulated by $[Ca^{2+}]_{cyt}$ -dependent phosphorylation at two sites. Phosphorylation at one site is inhibitory, whereas phosphorylation at the other site activates the channel. It has been proposed that $[Ca^{2+}]_{cyt}$ -dependent regulation of SV channels might prevent an excessive rise in $[Ca^{2+}]_{cyt}$, or modulate the kinetics of changes in $[Ca^{2+}]_{cyt}$ (Sanders *et al.*, 1999). The activity of SV channels is also reduced by 14-3-3 proteins (van den Wijngaard *et al.*, 2001). The genes(s) encoding SV channels are unknown, but KCO1 has been implicated in their formation, since SV-channel currents in mesophyll protoplasts from the arabidopsis *kco1* mutant are smaller than those from wild-type plants (Schonknecht *et al.*, 2002). At least two types of pharmacologically distinct hyperpolarization-activated, Ca^{2+} -permeable channels (HACC) have been reported in plant vacuoles (Allen and Sanders, 1997; White, 2000).

White and Bradley (2000)
Ann Bot 82, 467-511

Unnecessary words and phrases

Vague adjectives:

considerable, special, appreciable, substantial, dramatic ...

Corresponding adverbs:

considerably, specially,

An addition of EDTA resulted in leaching of cadmium that was ~~dramatically~~ 5-fold higher than in the control treatment.

Unnecessary words and phrases

Tautologies (ie. repeating the concept without clarifying it)

... in close proximity to ... (*near*, or *close to*)

... forward planning ... (*ever heard of 'backward planning'?*)

... general consensus ... (*consensus* is a general agreement)

... necessary prerequisite ... (*prerequisite* means *required* beforehand)

... vast expanse ... (*expanse* is a wide extent)

... slightly (very) unique ... (*unique* is one of a kind)

Unnecessary words and phrases

Avoid

Use

...over...

...more than...

...lower...

...less than... or ...fewer...

...following...

...after... or ...in...

...feel...

...think... or ...believe...

Make it short

Leave only what is ESSENTIAL to the subject of the paper.
Sentences and words that are MERELY RELEVANT need to be deleted.

Surgeon needs to cut through perfectly good skin to get at a medical problem. In surgery, the bottom line is the patient's health. In writing, the bottom line is

essential information.

Make it short

The bench on which the trial was conducted was moved periodically around the glasshouse (it was on wheels) so that plants were not influenced by a position factor with regard to growth, mainly due to differential shading by the beams in the glasshouse roof. (44 words)

From an Honours thesis

The position of pots in the glasshouse was changed periodically to minimise influence of any potential gradients in environmental parameters. (20 words)

Pots were re-randomised periodically to minimise influence of gradients in environmental parameters. (12 words)

Make it short

Phosphorus application to the growth medium had a significant effect on shoot phosphorus concentrations in both *pho2* mutant and the wild type (Fig. 2). With increasing phosphorus application, phosphorus concentration in shoots also increased markedly. (35 words)

Increasing phosphorus applications increased shoot phosphorus concentration 3-fold (Fig. 2). (10 words)

Both, either

...application of both citrate and malate to soil increases Ca, K and Mg availability.....

Were malate AND citrate applied TOGETHER or each of them SEPARATELY but gave the same result?

...application of either citrate or malate to soil increases Ca, K and Mg availability.....

Compare with, compare to

Primary school grammar:

'compare' is ALWAYS followed by 'with',
'contrast' is ALWAYS followed by 'to'.

What you need to do:

Comparing LIKE things requires 'with',
comparing UNLIKE things requires 'to'.

Shakespeare wrote:

"Shall I compare thee TO a summer's day?"

Compared TO a dinosaur, this lab equipment is not all that old.

Respectively

He completed the B.Sc. and Ph.D. degrees in biology and bioremediation in 1996 and 2003, respectively.

He completed the B.Sc. degree in biology in 1996 and the Ph.D. degree in bioremediation in 2003.

or

He completed the B.Sc. degree in 1996 and Ph.D. in 2003; both degrees were in the combined curriculum of biology and bioremediation.

Respectively

Concentrations of Ca, Mg, K, P, Na, B and Fe in soil solution were (in μM) 1438, 232, 12, 976, 2 and 37, respectively.

Concentrations in soil solution were (in μM): Ca 1438, Mg 232, K 12, P 9, Na 976, B 2 and Fe 37.

While, whereas

Whereas is used properly only in contrasts.

While is used to mean 'during the time that'.

Salinity decreased growth of eucalypts, ^{whereas} ~~while~~ the growth of melaleucas was unaffected.

While lifting a bottle of acid, he dropped a hammer.

Noun and verb **MUST** agree in number

She is going.
She is going with John.
John and her are going.

The committee finished their deliberations and reached its decision.

The committee finished their deliberations and reached their decision.

The committee finished its deliberations and reached its decision.

Noun and verb **MUST** agree in number

Every sample out of 500 were contaminated.
Every sample out of 500 was contaminated.
Every one of the 500 samples was contaminated.

Then 300 mL of water was added....
Then 300 mL of water were added...

In this formula, 50 mL is the minimum amount of reagent required.
In the second stage, 50 beads were rolled in...

Our data is good.
Our data are good.

Noun and verb **MUST** agree in number

Interestingly, Blatt and co-workers showed that the influx of Ca^{2+} through the plasma membrane Ca^{2+} channels are coupled to oscillations in plasma membrane potentials, and that ABA can regulate this influx of Ca^{2+} by increasing the probability of channel opening and by shifting the voltage sensitivity of these channels to more depolarizing potentials. Together these results suggest that ABA-induced oscillations in $[Ca^{2+}]_{cy}$ are the result of influx of Ca^{2+} through the plasma membrane due in part to channel gating by oscillations in membrane potentials and greater probabilities of Ca^{2+} channel opening

Ng and McAlrath (2003)
Ann Bot 92, 477-486.

Finish your comparisons

Mobility of heavy metals is lower in alkaline soils.

Mobility of heavy metals is lower in alkaline than in acid soils.

Punctuation

Full stop,
parentheses,
dash,
colon,
semicolon,
comma



Punctuation

I have a blue pencil, a red book and a yellow eraser.

There goes our lecturer, a scholar and a dog.

There goes our lecturer, a scholar, and a dog.

Rules about rules:

- 1) You need to know the rules.
- 2) Break the rules if you have a good reason (but see the rule number 1).

Punctuation

Neither slavery, nor involuntary servitude unless for the punishment of crime, shall ever be tolerated in this state.

Constitution of the State of Michigan, USA
Amended

Be accurate!!!!

Database	Content	Processor	Country	No. of publications
CAS	Genetics, medicine, weeds, bioassays, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	CAS International	UK	15422
Pubmed	Genetics, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	Intelligence System for Scientific Information (ISI)	IT	8970
Bioc	Genetics, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	Bioc	US	3892
AGRIS	Genetics, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	International Agricultural Research Institute (IARI)	IT	1087
EBSCO	Genetics, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	EBSCO Services	US	2422
Chemical Abstracts	Genetics, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	Chemical Abstracts Service	US	217
Web of Science	Genetics, bioinformatics, cell biology, cell culture, chemistry, plant, physiology	Web of Science	US	940

As can be seen in Table 1, of the seven databases researched, five come from the United States, one is from France and one from the Netherlands, which means that information on the area of knowledge is concentrated in the aforementioned developed nations.

AGRO-FOOD - Industry H/Tech, November/December 2002

Table 1. Level of citrate and citrate efflux in roots of transgenic 35S and control tobacco plants. Data are the means \pm SD of three independent experiments.

Line	Citrate levels (nmol per gram fresh weight)	Citrate efflux (nmol per seedling per hour)
Control	0.43 \pm 0.06	0.08
CSb-4	1.41 \pm 0.07	0.27
CSb-11	1.32 \pm 0.08	0.31
CSb-15	2.31 \pm 0.10	0.44
CSb-18	4.47 \pm 0.35	0.86

g citrate/g FW roots μ g/seedling per h

From: de la Fuente et al. (1997), Science 276, 1566-1568.

Do not use

Use

P < 0.05

because P=0.05 is also significant

P = 0.05

P > 0.05

because values for P=0.05 are between 0 and 1

... non-significant at P = 0.05; or

... non-significant (P<0.37) ...

hr, sec, gr, l, %

h, s, g, L, % (w/w) or
% (w/v) or % (v/v)

5g, 12m, 8h

5 g, 12 m, 8 h

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