
access
age
articles
audience
communication
consume
content
course
covered
digital
editions
environmental
example
forms
global
hard
important
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media
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news
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platforms
podcasts
political
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produced
professional
radio
range
read
receive
regular
reporting
required
science
scientific
sources
story
study
term
therefore
traditional
value

PUBLIC SPEAKING

Prof Peter O'Donoghue
Faculty of Science, UQ

Public Speaking

- One of our greatest fears!
  (US survey, 40% PS, 25% heights, 20% spiders, 10% death)(eulogy at funeral)
  (all about human psychology, being confident/assertive)(hands up, elbow/ear)
- Today is not an exemplar of best practice!
  (cf. Winston Churchill – classical orations; Steve Jobs – contemporary multimedia)
- Today is a workshop
  (by definition, a talk-fest)

Do not do as I do, do as I say!

I could be wrong! (but I'm not)

Science

Three fundamental activities:

- doing (observation, experimentation, methodology, technology)
- thinking (hypothetico-deductive logic, causality, interpretation)
- communicating (written language, spoken language) } very different!

Public speaking

- integral part of science
  (assumed generic communication skill)
- information dissemination + promotion
  (science and scientist)
- institutionalized
  (lectures, seminars, workshops, conferences)
- nature versus nurture
  (definitely learnt skill, improves with practice)
- healthy ego
  (all feedback is 'constructive')

TEN TIPS

Back-engineer topic	Six 'W's
PUBLIC	Why? Where? Who?
SPEAKING	What? When? How?

1. Be clear of purpose!

- know precisely why you are speaking
- obtain brief from organizers
  - content (topic, level, length, etc)
  - process (oration, a-v presentation, workshop, etc)
  - logistics (venue, facilities, audience, etc)
- develop own goals
  (take-home messages)
- decide on style
  (reminisce, informative, provocative)
  (be adventurous with story-lines, analogies, etc)

2. Reconnoitre the venue!

- walk the room
  (size, stage, screens, seating)
- test the technology
  (lights, microphone, computer, projector, etc)
- cater for recordings
  (media requirements, video, lighting, sound, etc)
- Murphy's Law
  (if something can go wrong, it will)
- do not be a techno-nerd!
  (have rescue strategies ready)

3. Know your audience!

- to whom are you speaking?
  (colleagues, peers, students, public)
- tailor your delivery
  (give them what they want!)
- greet audience members as they arrive
  (personalize the occasion)
- dress appropriately
  (up rather than down) (personal grooming)
- stay sober
  (alcohol confounds) (you and audience)

4. Tell/sell a story!

- make your story transparent to audience
  (develop logical thread, story-line)
- have a beginning, middle and end
  (triple exposure rule = preview, view, review)
- be prepared
  (practice, refine) (do not wing-it)
- know your topic
  (be an advocate - enthusiasm is infectious)
- use conversational language
  (beware of humour, personal anecdotes)

5. Watch the clock!

- know the schedule
  (your spot, mental/nervous preparation)
- expect delays
  (garrulous comperes, questions, rowdy audiences)
  (do not feel pressured to make up time)
- practice your timing
  (watch/timer)
- know when to stop
  (better to finish early than to drone on)
- watch for audience 'tells'
  (fidget factor)

6. First impressions!

- make them count
  (consciously, subconsciously)
- harness nervous energy
  (adrenalin is normal)
  (approach lectern composed)
  (activate audio-visuals)
  (take a breath and pause)
  (acknowledge chair)
  (acknowledge audience) (eye-contact)
  (say hello and introduce yourself) (stolen thunder)
  (introduce your topic) (well-practiced opening)
- set the scene and tone

7. Have a conversation!

- use conversational rather than formal language
  (spoken v. written word, dialectic v. didactic)
- keep your sentences short, sharp and shiny
  (avoid verbosity, repetition) (speak slowly, clearly)
- appear spontaneous, even though using triggers
  (but avoid reading from scripts, cue-cards, or slides)
- you are the star, not your slides
  (dot-points, simple images)
- look and speak to audience, remember to breath
  (back-row volume, 3-second eye-contact rule)

8. Be theatrical!

- you are acting a part
  (be serious, flamboyant, dramatic, etc)
- adopt performance persona
  (exaggerate language, expressions, actions)
- body language
  (smile, posture, gesticulation, movement)
- physical props
  (think beyond ppt)
- use humour sparingly
  (your audience often does not get it)

9. Be confident!

- visualize success
  (imagine the audience clapping)
- control self-doubt
  (you are probably your own worst critic)
- do not be an apologist
  (negativity destroys)
- trust polite society, the audience is forgiving
  (what is the worst they can do)
- hammer home message
  (have defined outcomes/expectations)

10. Prepare, Practice!

- prepare, practice, refine
  (repeat cycle several times)
- live simulations
  (practice out loud, in front of a mirror, to a friend)
- rehearse with props
  (familiarity, choreography, etc)
- mimic successful public speakers
  (research styles, habits, etc)
- have fun!
  (enjoy yourself, then so will your audience)

Summary: 10 tips for public speaking

PUBLIC	Why?	1. Be clear of purpose!	(intent, goals, brief)
	Where?	2. Recon the venue!	(room, audio-visual aids)
	Who?	3. Know your audience!	(intellectual level, dress, sobriety)
SPEAKING	What?	4. Tell/sell a story!	(content, story-line, a-v aids)
	When?	5. Watch the clock!	(schedule, timing)
	How?	6. First impressions!	(introduction, first words)
		7. Have a conversation!	(volume, speed, text, eyes)
		8. Be theatrical!	(comedy, drama, gesticulation)
		9. Be confident!	(relax, nerves, errors, apologies)
		10. Prepare, Practice!	(aloud to others, watch masters)

Take every opportunity to speak!

Thank you for your attention!

TEN TIPS FOR PUBLIC SPEAKING

As a practicing scientist, you will be called upon to speak in public about your work. This is crucial for the dissemination and promotion of not only your science but also yourself. Public presentations are often in the form of conference papers or research seminars, but can also include lectures, tutorials, workshops, speeches, press reports, debates, etc. While many think public speaking may come naturally or intuitively to some people, this is incorrect as we can all communicate with each other and hold conversations. Effective public speaking is a learnt skill – the more you practice, the better you get. But you have to be open to feedback in the form of suggestions, comments and criticisms. You also have to have a healthy ego so that you learn and grow, rather than wither and hide.

PUBLIC	**Why?**	1. Be clear of purpose!	(intent, goals, brief)
	Where?	2. Recon the venue!	(room, audio-visual aids)
	Who?	3. Know your audience!	(intellectual level, dress, sobriety)
SPEAKING	**What?**	4. Tell/sell a story!	(content, story-line, a-v aids)
	When?	5. Watch the clock!	(schedule, timing)
	How?	6. First impressions!	(introduction, first words)
		7. Have a conversation!	(volume, speed, text, eyes)
		8. Be theatrical!	(comedy, drama, gesticulation)
		9. Be confident!	(relax, nerves, errors, apologies)
		10. Prepare, Practice!	(aloud to others, watch masters)

1. Be clear of purpose!

Know precisely why you are speaking. Get a clear brief from the organizers with specific indications for content (topic, level, length, etc), process (oration at lectern, audio-visual presentation, informal workshop, after-dinner speech, etc) and logistics (venue, facilities, expected size and type of audience, etc). If such information is not forthcoming, aggressively pursue answers because it is your credibility and reputation that is on the line. There is nothing worse than pitching your talk wrong for the occasion.

Develop your own goals for the talk. Are you going to reminisce, be informative, be provocative? Find a few take-home messages to concentrate on rather than give encyclopaedic coverage. This will enable you to find a common thread to tie your talk together. Be adventurous in developing story-lines and using analogies.

2. Reconnoitre the venue!

Insist on checking out the physical specifications of the venue. Walk the room, switch on the microphone, dim the lights, boot up the computer, test the data projector, remote control, laser pointer, etc. Will the press or media be in attendance, will they have specific requirements for video, lighting, sound, etc. The more familiar you are with your environment, the more comfortable you will be during your presentation. Remember Murphy's Law - if something can go wrong, it will! Be prepared and have a rescue strategy (spare batteries, names of IT personnel, venue manager). You can all recall seeing a speaker embarrassed by technical problems; do not be one of them!

3. Know your audience!

To whom are you speaking? If they are colleagues, they probably want to learn something from you. If they are friends, they are likely looking to be entertained. Know who your audience is and tailor your speech and delivery to them. Give them what they want! Predict their intellectual level and pitch your talk accordingly. You score more accolades by paraphrasing complex material into simpler language, than vice-versa. Greet some of the audience members as they arrive. It is easier to speak to a group of friends than to strangers.

Make sure you are dressed appropriately for the occasion. By engaging in public speaking, you are portraying the role of respected authority so adopt a professional dress code. Under-dressing intimates contempt, over-dressing suggests arrogance, mimicking the audience dress-style works if you are of the same generation and it is an informal occasion. In general, it is best to dress slightly better than your audience to show respect. Pay attention to personal grooming. There is nothing worse than distracting the audience by pillow hair, wayward shirt tails, open flies, etc. The better you look, the more ready and professional you will feel. A lot of people are going to be looking at you - make sure you look your best.

Stay sober. Do not try to calm nerves with alcohol. It interferes with your judgement and trips your tongue. You also need to gauge the sobriety of the audience. Speaking at social functions where alcohol is served requires more finesse and versatility that at more formal events.

4. Tell/sell a story!

Public presentations are full of content which has structure often only transparent to the presenter. Make your story transparent to your audience. Develop a logical thread or story-line that your audience can, and wants to, follow. Have a beginning, middle and end. You are giving the talk because you are the content expert. It is therefore your job to communicate your content in an informative and entertaining manner.

Be prepared. Make sure you have spent time working on your talk, practicing it and refining it. Use the triple exposure rule – preview, view, review! Get comfortable with your material. 'Winging it' is not a good idea. While 'going with the flow' and 'being flexible' is smart, trusting yourself to be brilliant without any preparation is something professionals do not attempt. Do your research. Know

your topic and what you are going to say about it and how you would like to say it. Use humour, personal stories and conversational language – that way you will not easily forget what to say and the more confident you will be up there. Be an advocate for your topic! Enthusiasm is infectious. Model effervescent behaviours to captivate and motivate your listeners. Show the audience your passion without being manic.

5. Watch the clock!

Know when your talk is scheduled in the proceedings. Are you the only speaker, the third speaker, etc. Expect time delays due to garrulous comperes/speakers, extended question periods or rowdy audiences. Few events run according to schedule. Nonetheless, do not feel pressured to make up time due to the tardiness of others. Know exactly what is expected of you and deliver that - and no more. Practice the timing of your talk and use your own watch or timer on the lectern to monitor your progress. Know when to stop talking. It is better to finish your talk early than to go overtime. We have all been tortured by a speaker who goes on and on, caring little for the audience's interest or comfort level. Do not be one of those speakers.

6. First impressions!

Everyone judges everyone else on first impressions (consciously and subconsciously). Make your first impressions count. Do not be a 'nervous neddy' and leap into the fray. Approach the lectern composed and comfortable. Make sure your audio-visual aids and remote-controls are at hand. Take a breath and pause. Acknowledge the compere/chairperson, then turn and look at the audience. Having practiced your first few sentences over and over in your mind, you should be able to recite them perfectly. This will give you time to settle into the flow of your talk and dispel any nervousness. Say hello, introduce yourself and your topic. Sometimes, your introductory thunder may have been stolen by an overzealous chairperson. Do not let this throw you. Stick to your introductory remarks because they set the scene and tone.

7. Have a conversation!

The best public speakers appear to have a conversation with every member of their audience. They use conversational rather than formal language. There is a marked difference between spoken words appropriate for the ear and formally written words intended for reading. Public speaking has moved from the formal didactic orations of the past to more informal dialectic discussions (see any media outlet for contemporary styles). Keep your sentences short, sharp and clear. Avoid unnecessary words or previews, do not bore your audience with repetition. If you can at all avoid it, try not to read your presentation from a written script. It lacks spontaneity, and ties you to the lectern. By all means, develop written notes or palm-cards as reminders to yourself, but try not to refer to them unless in an emergency. Above all, do not read your PowerPoint slides. Your audience can read them faster than you can say them. Audio-visual aids are simply that, they are aids (not replacements for the real thing). They should be in dot-point form rather than sentences, they should have a train of logic transparent to the viewer, and they should not be buried under animations, clipart or images. They should give a clear synopsis of what you are saying!

Remember that you are speaking to an audience. Modulate the tone, volume, inflection and speed of your spoken language. Speak slowly, enunciate clearly, and show appropriate emotion and feeling relating to your topic. Establish rapport with your audience. Speak to the person farthest away from you to ensure your voice is loud enough to project to the back of the room. Pause and take breaths at appropriate intervals. One of the biggest indicators of nervousness is the lightning-fast talker. You might have the best speech ever written, but if no one can understand what you are saying, it does not matter. Pace yourself and remember to speak at a normal (or even slightly slower) pace when you are speaking publicly.

People trust those who look them in the eye, so look at your audience when you are speaking. Do not look at the floor or over their heads. Maintain sincere eye contact with your audience. Use the

three-second method, e.g. look straight into the eyes of a person in the audience for three seconds at a time. Have direct eye contact with a number of people in the audience, and every now and then glance at the whole audience while speaking. Use your eye contact to make everyone in your audience feel involved.

8. Be theatrical!

When you are presenting in front of an audience, you are performing like an actor on stage. Actors learn early in their careers to over-emphasize their roles and be noticed, rather than be subtle and over-looked. How you are perceived is up to you. Be solemn if your topic is serious. Be humorous if the situation permits. Be dramatic to emphasize material. Gesticulate to be dynamic and vibrant. Portray the character you desire for your audience. Look pleasant, enthusiastic and confident. Body language is important. Standing, walking or moving about with appropriate hand gesture or facial expression is preferred to sitting down or standing still with head down and reading from a prepared speech. Use audio-visual aids or props for enhancement if appropriate and necessary. You do not have to be a comedian, but a few light-hearted comments can help humanize you to your audience. Win them over with a smile and a well-timed clever remark, if you can. But be advised, too many jokes can weaken the validity of a presentation.

9. Be confident!

Negative thinking will get you nowhere but down in the dumps. If you believe that you will be great, you will be. If you think you are going to fail, you probably will. It is as simple as that. Visualize yourself giving your speech. Imagine yourself speaking, your voice loud, clear and confident. Visualize the audience clapping – it will boost your confidence. We are usually our own worst critics. If you forget to read a sentence off your notes, it is doubtful anyone will know. If you skip forward to the next image on the projector by mistake, no one is going to run you out of town. Do not worry. It is not life or death, it is just a speech. Begin by addressing the audience. It buys you time and calms your nerves. Pause, smile and count to three before saying anything. Transform nervous energy into enthusiasm. Your body produces adrenalin to make it ready for fight or flight. Harness that energy.

If it makes you feel better to announce to the room that you are so nervous before you begin, go ahead. But your speech will have a lot more weight if you do not. Chances are good that you are the only one who knows you are shaking in your boots - why show the cracks in your armour? Let them believe you have it under control, even if you do not feel like you do. So you tripped on the microphone cord. So what? So you said ‘macro’ when you meant ‘micro’ somewhere in your speech. So what? Everyone makes mistakes. Acknowledge them and move on. Do not apologize for any nervousness or problem – the audience probably never noticed it.

10. Prepare, Practice!

Once you are prepared, go through the speech. Then read it again. Then again. And then once more. Practice in front of a mirror. Practice out loud. Practice to a friend, a family member or even your dog. Every time you go through your presentation, you are adding another layer of "I know this stuff." Rehearse with all equipment you plan on using. Revise as necessary. Practice, pause and breathe. Practice with a timer and allow time for the unexpected. Look to examples of who you consider to be successful public speakers. Note their styles and habits and keep them in mind as good examples. Terminate your presentation with an interesting remark or an appropriate punch line. Leave your listeners with a positive impression and a sense of completion. Do not belabour your closing remarks. Thank your audience and sit down.

Above all, enjoy yourself, and then your audience will as well!

How to give a seminar!

Peter O'Donoghue
UQ Faculty of Science

HOW TO GIVE A SEMINAR – NOT!

(or: things to avoid when presenting material)

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Example of bad practice

Caveats

- This presentation is not a 'prescription'!
  (Do as I say, not as I do!)
- Of necessity, it is verbose!
  (content-rich, exemplars)
- These are my opinions!
  (I could be wrong, but I'm not!)*

*Suslick (2012)

Science

Three fundamental activities:

- doing (observation, experimentation, methodology, technology)
- thinking (hypothetico-deductive logic, causality, interpretation)
- communicating (written language, spoken language) } very different!

Public speaking

No single prescriptive approach:
- innate plus learnt behaviours/skills
- idiosyncratic, but mostly common-sense

Many types:
- every conversation, discussion
- committees, meetings
- workshops, tutorials, lectures
- speeches, orations
- seminar presentations

Seminar presentations

Institutionalized in contemporary culture
(informative / instructive / promotional / theatric /...)


Seminar presentations

Institutionalized in contemporary culture
(informative / instructive / promotional / theatric /...)

Holistic activity involving:

- philosophy / economics (why?)
- psychology / social sciences (who?)
- geography / physics (where?)
- resource management (when?)
- multi-disciplinary content (what?)
- communication technologies (how?)

ICT technologies

- black-boards, white-boards
- projectors (slide / overhead / data)
- audio recorders / players
- film / video cameras / players
- computers (laptop / desktop)
- presentation software (PowerPoint®)
- multimedia (various combinations)

PowerPoint®

Commonly accepted standard:

- remember it is a talk, supported by slides
  (you are the star, not your slides)
- avoid templates (KISS principle)
- be professional (you are on show)
- remember your audience!

Aristotle's tripod

Persuasion is reliant on:

- logical, coherent argument (*logos*)
- speaker's charisma (*ethos*)
- audience receptiveness (*pathos*)

Principles

Big 6 skills approach ("Educational Psychology"):

• define	(identify task / product)	1
• prepare	(argument / logic chain)	2
• synthesize	(organize, arrange)	2
• practice	(rehearse, refine)	3
• perform	(presentation, process)	3
• evaluate	(efficacy, feedback)	4

1. Definition

Task + Product

- purpose (intent, goals)
- format (process, place, time)
- content (story, key message)
- presenter (self-promotion, ego)

Get to The point!
What will interest audience?

Brief

Confer with organizers

- format (formality, duration, Q/A, ….)
- logistics (venue, facilities)
- audience (size, type, demographic)
- extras (abstract, script, promo, recorded)

Begin drafting (reiterative task)

2. Preparation

Develop structure / theme / style

- story (substance, scope, sequence) (planning, organization)
- slides (text – written cf. spoken) (graphics)

Write it down, the list will remember for you!
Compartmentalize into smaller tasks!

Structure

IMRAD default

- Introduction
- Materials & methods
- Results
- Discussion

Script story-board

- title
- field
- problem
- objectives
- approach
- results 1
- results 2
- summary
- future
- acknowledgements

Tell a story

Identify key finding (your major achievement)
- one short sentence
- one simple graphic

Back-engineer (to give context)
- result ← approach ← problem ← field

Simplify methodology (quantify)
- flow-chart, numbers

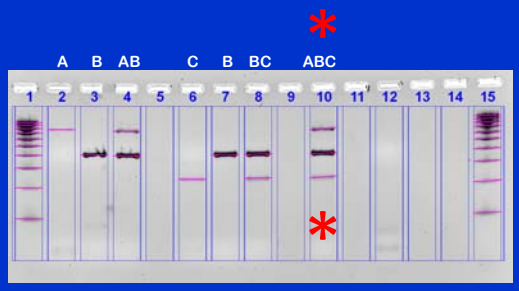
Begin and Finish
- relevance, conclusions, significance

e.g.

Hypothetical seminar

e.g. Talk based around key finding

Developed multiplex PCR for 3 infections (A, B, C):

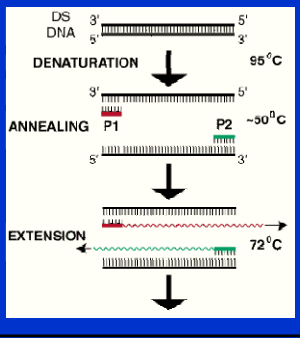


Back-engineer

multiplex PCR	- detect single/mixed infections
'single-plex' PCR	- amplicons right size
PCR	- DNA amplification (touch-down)
primer design	- 6 sets out of 2,000 designed
microbes	- *Anaplasma, Ehrlichia, Babesia*
diseases	- canine vector-borne (CVB)
hosts	- dogs (possible zoonoses)
problem	- blood disorders

Methodology

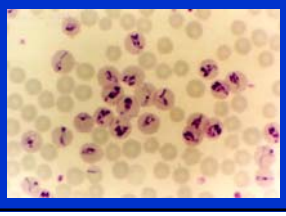
PCR
- principle
- primers
- cycle



Begin

Title:

"Development of multiplex PCR test for canine vector-borne diseases"



Finish

PROS	CONS
new diagnostic test	high tech
rapid	standardization
sensitive	comparable?
cheap	3 of 10 diseases
quantitative	subclinical disease?

now develop ppt slides

Slides

Number depends on:

- complexity (text + graphics)(one idea per slide)
- relevance (necessary versus gratuitous)

TV 5 second-grab rule (= far too many!!!!!)

- two per minute (120/hr)
- one per minute (60/hr)
- one per two minutes (30/hr) **
- one per three minutes (20/hr)

Design

Orientation (landscape)

Graphic design (visual arts)

Rule of thirds (page layout)

Rule of fives (dot-points)

etc, etc, etc, etc, etc

Backgrounds

Beware transparent graphics/photographs

Beware graduated colours

Remember standard theme/style

Remember contrast

Example of bad practice

Backgrounds

There are some truly horrible templates available

Example of bad practice

Colour

Colours affect audience psychology

Select text/background colour combination with best visual acuity (contrast – brightness)

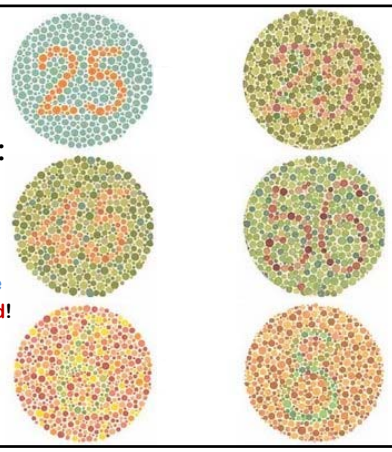
	white	white	white	white	white	white
red		red	red	red	red	red
orange	orange		orange	orange	orange	orange
yellow	yellow	yellow		yellow	yellow	yellow
green	green	green	green		green	green
blue	blue	blue	blue	blue		blue
black	black	black	black	black	black	

It is all about comfortable contrast

It is all about comfortable contrast

Remember:

some people are colour-challenged!



Font - type

Typography (avoid serif fonts, use sans serif)

- Times New Roman
- Lucinda Bright
- Vivaldi Script
- Brush Script

- Arial Rounded
- Tahoma
- Calibri
- Verdana

Serif

small decorations on characters called serifs

Sans Serif

Font - size

This is 44 point
This is 36 point
This is 32 point
This is 28 point
This is 24 point
This is 20 point
This is 18 point
This is 16 point
This is 14 point
This is 12 point
This is 10 point
This is 8 point

Titles

Headings

- Subheadings

Too small (Fist rule!)

CAPITALS ARE HARD TO READ FAST: avoid them

Text

Phrases, keywords (not sentences)

Do not provide text in complete sentences, otherwise your audience will soon lose patience and stop reading the voluminous garbage you have used to clutter the screen. They will switch off and daydream about far better things - like holidays, sex, booze, sex, food, sex, footy, etc.

Paraphrase (do not read)

Do not read your slides, the audience already has! Say it differently!

Bullet-points (# & style)

Use >1 but < 6! Use one rank only. Stay simple.

• = ☑ ☒ = ♦ ♥ ♠ ♣ ⇨ ◊ ⊗ ❻ ◎ ✶ ✧ ✂ ☎ ☺ ☹ ☯ ✞ ☜ ☠

Referencing

Do not plagiarise! Cite sources. Simply! O'Donoghue (2012)

Example of bad practice

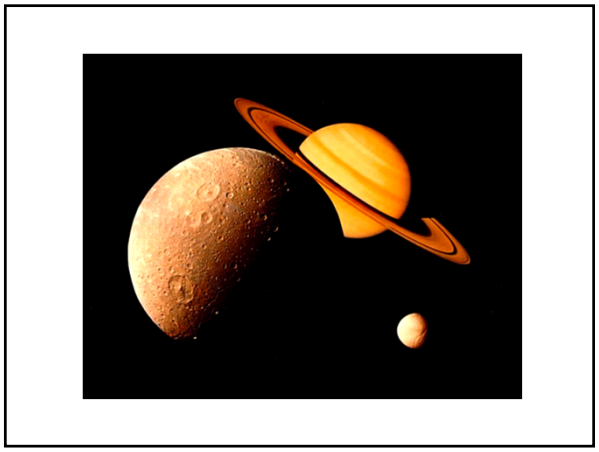
Images

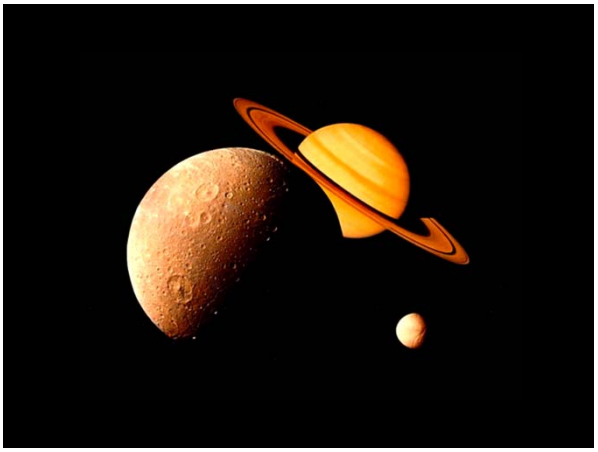
- Use sparingly, when necessary
- Must be relevant (e.g. photos, graphs)
- Be professional (high quality) (avoid ClipArt)
- Use jpg or png, not tif (200 dpi for projection)

Double contrast

- photograph
- background dominates
- dimmed room

Too much contrast change too often can hurt





Photographs - people

Watch size!

Photographs - people

Lock aspect ratio (L:W)

Photographs - people

Photographs - animals

Cute, but does not contribute much!

Photographs - places

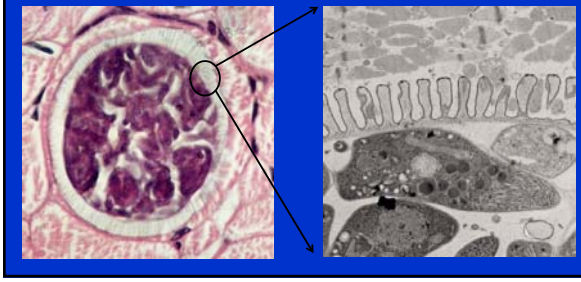
Attempted humour, but does not contribute much!

Photomicrographs

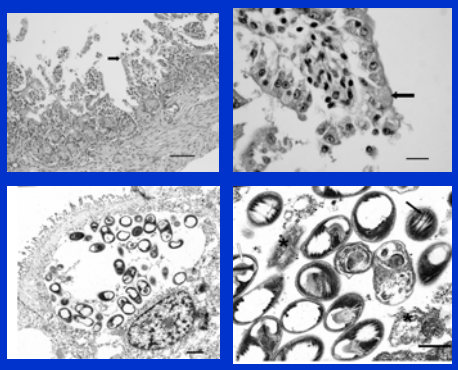
Parasite cyst wall architecture

light microscope

electron microscope



Microsporidia from koalas



Example of bad practice

Testate amoebae from the River Murray

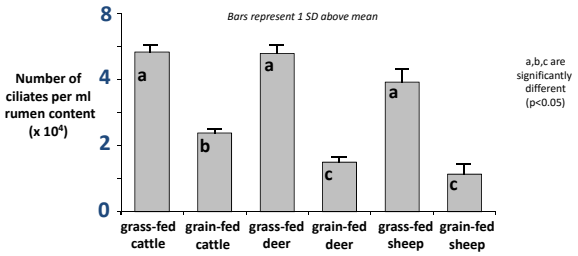
Arcella arenaria (proteinaceous test)

Lesqueruesia spiralis (siliceous test)

Graphs

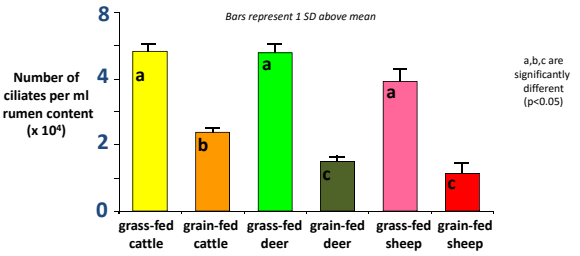
- Stay with 2-D graphs
- Give an informative title [not an abstract]
- Select appropriate style
  [discrete data: bar-graphs, for comparison]
  [continuous data: line-graphs, with plots]
- Label and scale axes [with units]
- Give the bottom line [⇒ key finding]

Rumen ciliate populations in ruminants fed grass versus grain diets



⇒ feed-lot diets reduce endosymbiotic ciliate populations

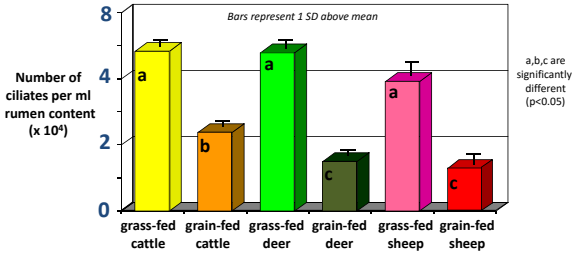
Rumen ciliate populations in ruminants fed grass versus grain diets



⇒ feed-lot diets reduce endosymbiotic ciliate populations

Colour-enhanced. Do the colors add value to the data?

Rumen ciliate populations in ruminants fed grass versus grain diets

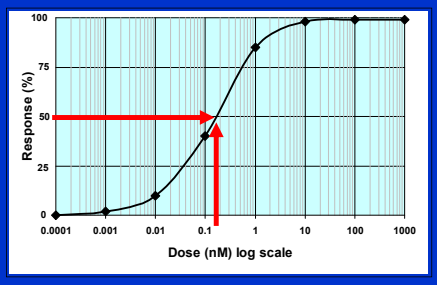


⇒ feed-lot diets reduce endosymbiotic ciliate populations

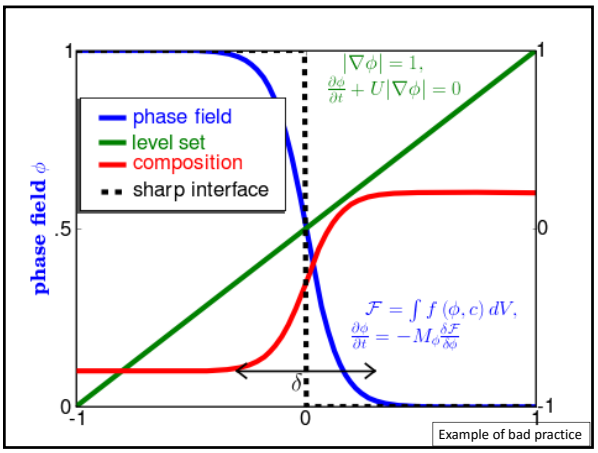
Over-enhanced becomes distracting!

Dose-response curve

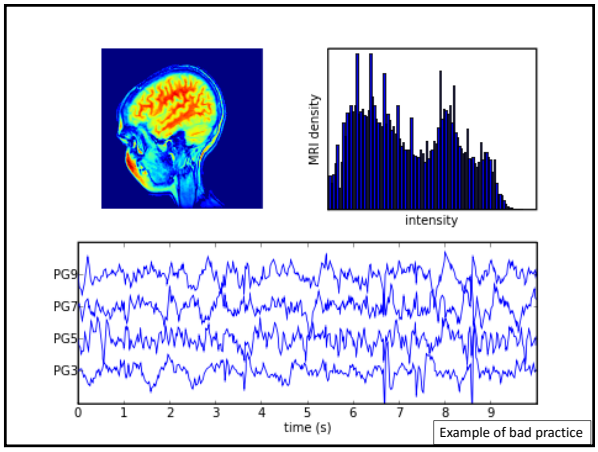
Artemisinin against *Plasmodium falciparum*



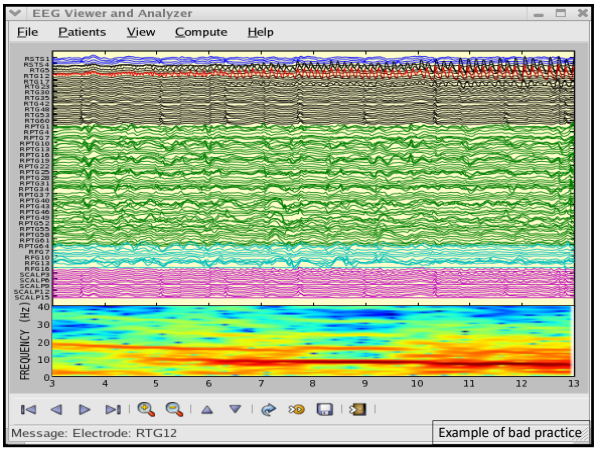
⇒ 50% lethal dose (LD_{50}) ~ 0.2 nM



Example of bad practice

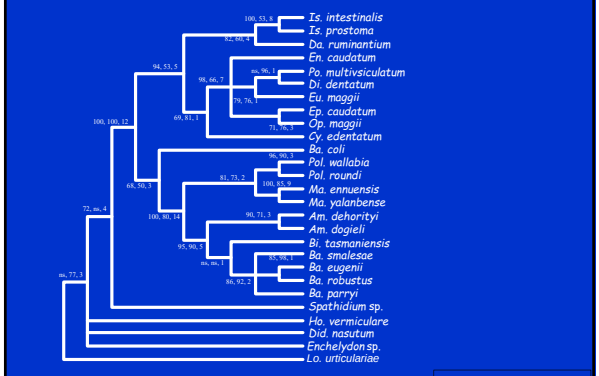


Example of bad practice



Example of bad practice

Phylogenetic relationships between endosymbiotic ciliates

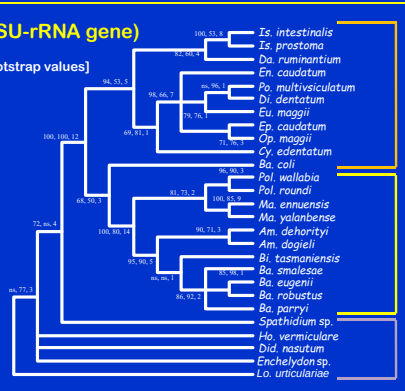


Example of bad practice

Phylogenetic relationships between endosymbiotic ciliates

(SSU-rRNA gene)

[bootstrap values]



ciliates from eutherian mammals

ciliates from Australian marsupials

free-living outgroups

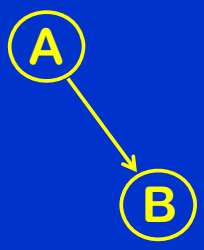
not much better

Animations

Avoid long complex animation sequences

Use them to:

- show train of logic
- connect concepts
- highlight specific items
- annotate figures

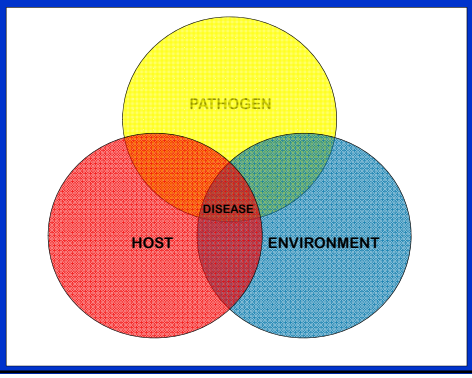


Example of bad practice

What are PROTOZOA?

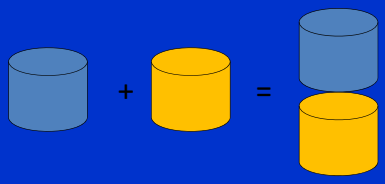
- proto-zoa = first animals
- assemblage of organisms
  - not primitive (sophisticated extant forms)
  - members diverse in form and function
  - assemblage of convenience
  - basal to meta-zoa

Disease Triangle



Animation helper

- Place a small icon ✦ at the bottom to tell you how many steps there are in your animation.



✦✦✦

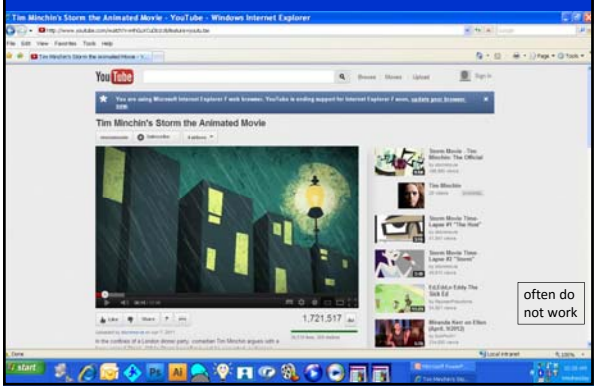
Embedded material

Audio (you are talking, why bury it in noise?)

Video (you are live, why defer?)

- must illustrate something relevant/important
- must contribute to story (not detract)
- use to show:
  - live motion (action sequence)
  - contemporary anecdote
- remember Murphy's Law

Internet links: click, click, click, click, click, click, ...



Fermentation in action!

3. Presentation

You are giving a performance!

• practice!!!!!!	(out loud, to audience)
• psyche-up	(prepare mentally)
• begin	(first impressions, nervous energy)
• role-play	(act, be melodramatic, gesticulate)
• advocate	(enthusiasm is infectious)
• end	(finish with a flourish)

Ten tips for public speaking!

Be clear of purpose!	First impressions!
Recon the venue!	Have a conversation!
Know your audience!	Watch the clock!
Develop a story!	Be theatrical!
Prepare, Practice!	Be confident!

Get ready, get set… …Go!

Personal habits

Standing:	stand free and relaxed, do not lean
Pacing:	if you must, pace slowly and deliberately
Facing:	face the audience, not the screen
	make eye-contact (3 sec rule)
Fidgeting:	keep your hands out of your pockets
	practice gesticulations
	practice using a pointer
Speaking:	enunciate, vary pitch, broadcast
	avoid 'um', 'er', 'OK', 'you know', etc
Humour:	use sparingly, often unintended consequences

Mnemonics

Memory aids:

- use as safety/security blanket
- place on lectern for quick referral, if necessary

• written script	do not read your talk
	hard to find place in block text
• palm cards	annotated key words, slide index
• ppt slides	refer to screen
	pause for transition
	use occasion to breath

Acknowledgements

Try not to thank a cast of thousands
Limit it to the least number:

- co-authors
- vital collaborators
- service providers
- host organizations

Avoid:

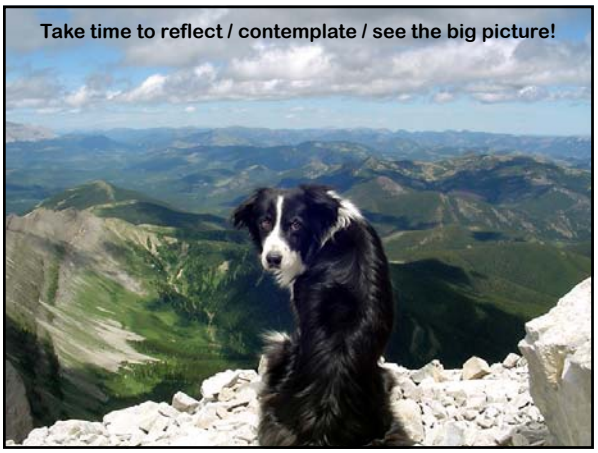
- social group photos
- montages
- corporate logos

most accompanying photographs are not professional and irrelevant

STOP!

Know when to end (do not ramble)
- make your conclusion / acknowledgements
- say "Thank you for your attention"
- then sit down / withdraw

It is up to the Chair-person to:
- initiate applause
- ask for questions
- thank you!



4. Evaluation

Did the seminar work? (assess impact / efficacy)

Extrinsic
- feedback (body language, eye contact)
- critique (invite comment)
- engagement (subjective / objective)

Intrinsic
- feelings (buoyant - disappointed)
- reflection (content, process, people)
- Quo vadit? (what next?)

Above all, have fun!

How to give a poster!

Peter O'Donoghue
UQ Faculty of Science

Posters

- poster presentations (visual communication tools) (creative medium)
- not 'performance-art' (unlike public-speaking)
- not 'publication' (unlike written papers)

- science on show (poster shows, not tells)

- show-case work (science)
- show-case self (personal, professional)
- inform audience (education)
- promote product (commercial)

Process

Usual chain of events:

- decided/invited to attend event
  (financial reimbursement often tied to presentation)
- submit abstract, request paper/poster
- acceptance by organizing committee
- produce poster, display at event
  (accompanied / unaccompanied; prizes)
- what to do with it afterwards

Abstract

Not part of poster, but part of process

Summary/synopsis (IMRAD):

- introduction (topic, context, problem, approach)
- methodology (observational/experimental)
- results (key findings, analyses)
- discussion (conclusions, significance)

Perfect script for poster (Einstein's guide)

Einstein's Guide to Scientific Abstraction

Be methodical / systematic / scientific!

~~$E = ma^2$~~ ~~$E = mb^2$~~ $E = mc^2$ ~~$E = md^2$~~

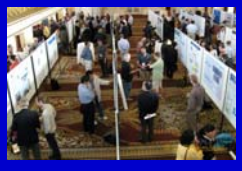
Four categories of 'Scientific Method' (hypothetico-deductive logic)

Introduction	Materials/Methods	Results	Discussion
- identify topic	- sample strategy	- describe findings	- answer hypothesis
- specify problem	- main techniques	- enumerate data	- state significance
- state aims	- how analysed	- show links	- assess implications

write one sentence for each dot-point = 12 sentences = complete abstract
also = your logic chain for your paper/poster

Poster

Situation
- conference/workshop
- seminar/meeting
- exposition/soiree
- exhibit/promotion



- not refereed publications! (disclaimers)
  [still listed in c.v. as productivity parameter]
- different rules apply (take some liberties)
  - must comply with IP, ©, plagiarism rules
  - but uses visual grammar (graphic design)
  - and simple language (declarative v descriptive)

Purpose!

Know your message!

- decide on your key message
- how to support it with graphics and text
- make the strongest statement your data supports

[Keep your focus! Do not waver!]

Know your audience!

- specialists (peers/colleagues)
- generalists (scientists in allied fields)
- lay-persons (general public)

[Moderate content accordingly]

Opportunity

Ten second rule (get someone to read it)
- capture reader in 10 seconds
- eye-catching, visual appeal
- easily identifiable topic

⇒ DESIGN

Ten minute rule (get someone to understand it)
- read whole poster in 10 minutes
- understand your message
- think you are wonderful

⇒ CONTENT

Venue

Poster display

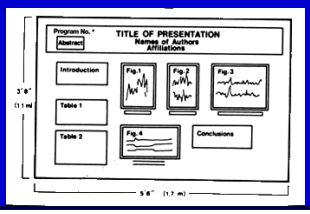
- location (area, number of competitors)
  (room, corridor, obstructions)
- session (hours v. days)
  (dedicated session v. happy hour)
- author (in attendance v. absentia)
- speed presentations

Poster

Four stages (4 P's):

- Planning (vital intellectual stage)
- Preparation (creative stage)
- Proofing (critical stage)
- Presentation (performance stage)

embrace drafts



Frankenstein's Guide to Poster Preparation




gather bones	assemble skeleton	flesh it out	dress the body
- identify key components - back-engineer title	- provide logical structure/headings - draft key graphics	- identify specific content - keywords phrases	- write sentences - size graphics - grammar punctuation
Planning phase	Construction phase		Writing phase

Content

Style

- informative (conventional v. contemporary)
- promotional (advertisement!)
- above all, professional and scientific!

Structure

- context, logic chain, scientific rationale
- hypotheses v. objectives
- evidence-based (observations / experiments)
- result hierarchy
- conclusion(s)

Story

Story-line (IMRAD default, but do better!)

- beginning — title, objective(s)/finding(s)
- middle — context, methods, findings
- end — conclusion

What is going to take centre-stage!

- key message, key graphic
- rest must be relevant and supportive
- statement of achievement (not litany of conduct)

Title

- often only thing read, not an abstract [KISS]
- provocative question v. summative answer
- avoid exaggerated claims ["New cure for cancer!"]
- sentence structure

ELISA PAGE AIDS SIDS

Immune detection of parasitic cysts in human brain

Inference of phylogenetic relationships between haemosporidian (*Plasmodium*, *Haemoproteus*), piroplasms (*Babesia*, *Theileria*) and kinetoplastids (*Trypanosoma*, *Leishmania*) using small subunit ribosomal RNA gene sequence comparisons

Presenters

Author(s), institution(s)

- often prescribed by organizers (but personalize)
- avoid logos, corporate motifs [KISS]
- not a qualifications endorsement
- not an address label

Peter O'Donoghue[1], Linda Ly[1] and Veronica Zhang[2]

[1]Molecular Biosciences, The University of Queensland
[2]Army Malaria Institute, Enoggera, Queensland

Content

Show scientific rationale / logic / sequence / continuity

1. Problem (reason)
2. Approach (did this)
3. Findings (found this)
4. Interpretation (means this)

Make it fundamental / obvious / clear / simple

Language

Keep it simple!

Felis catus deposited *gluteus maximus* on woven jute floor covering [the cat sat on the mat]

Be bold!

- declarative [A causes B]
- descriptive [effect of A on B]
- cautious [possible relationship between A and B]

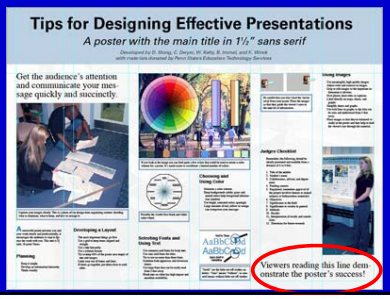
Flag sections!

- highlight headings
- use them to summarize

A correlated to B

Finish

- single take-home message [highlighted, large font]
- end positive ["A causes B"]
- do not equivocate ["Further studies are . . ."]



Citations

References

- only those absolutely necessary (copyright / plagiarism)
- your poster is not a paper
- avoid self-citation

Acknowledgements

- only those absolutely necessary (intellectual property)
- funding source(s)
- avoid logos
- [KISS]

Design

Poster

- size
- layout
- acuity
- text
- graphics
- photos

- software
- hard-copy

Size

- dimensions

USA sizes			International	
36x48	42x60	48x48	91x122	A0
36x56	42x72	48x72	70x100	A1
36x60	42x90	48x96	100x140	A3
36x72	40x30	-	100x100	-
36x96	-	Trifold	100x200	-

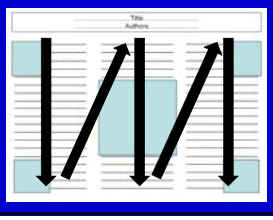
- orientation

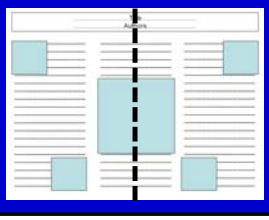

landscape


portrait

Layout

- graphic design (rule of thirds, etc…)
- sign-posts (links, arrows, numbers, …)
- 'reader-gravity' (columns: top-bottom, left-right)
- balance (axis of symmetry)





Acuity

- contrast / brightness [viewed in lit room]
- colours [use ≤ 3 prime colours]
- background [avoid dark backgrounds]
  [use white space]
- viewing distance [2-10 m to capture interest]
  [1-2 m to read]

Text

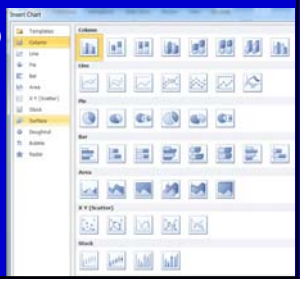
- font [sans-serif for headings, serif for body text]
- size [develop textual hierarchy]
  [Title : Headings : Body]
  [84 : 48 : 24 point]
  [in general: the bigger, the better]
- amount [word count ~ 800]

  - headings / subheadings
  - paragraphs / blocks
  - sentences / phrases
  - bullet-points

Graphics

Graphs (quickly show relationships)
•accommodate superficial and detailed examination
(e.g. bold trend-line over softer data-points)

Carefully select type
(do not use 3-D charts for 2-D data)



- column / bar charts
  [for comparisons]
- stock charts
  [for variance]
- scatter / line charts
  [for trends]
- pie / doughnut charts
  [for proportions]

Photographs

Picture worth 1,000 words
•must be necessary, relevant, appropriate

- pixellation [resolution ≥ 300 dpi]
- borders [format, boundary]
- composition [foreground / background]
- labels [arrows, scale bars]
- legends [make them statements]

Proof

Print a single A4 page mock-up

- can you read every word?
  - edit
- conduct structural review (at a distance for substance)
  - edit
- conduct stylistic review (up close for speling, garmmar)
  - edit
- sixty second check (do you get message in 1 minute)
  - edit
- give to colleagues and invite anonymous feedback
  - edit
- read it out loud
  - edit

Printing

Hard copy

- print poster
  - paper (cheap, fragile)
  - board (rigid, difficult)
  - plastic/fabric (dear, easy)
- print flyers (A4 handouts – pdf)
- transport (roll, fold, seal, …)
- affixing (velcro, pins, tape, …)

Engagement

- portrait photo on poster, stand by poster
- dress for occasion, attend to personal hygiene
- let them read, then make eye contact
- elicit conversation
  - ask questions
  - answer questions
  - prepared patter
- handouts
  - cards/contacts
  - flyer/mini-poster

Templates

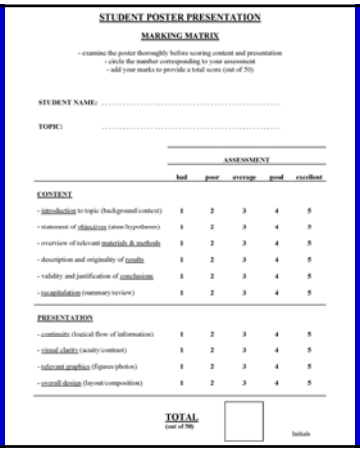
- no such thing as perfect poster
- no perfect precription

Why?

- idiosyncratic
- subjective
- content-dependent

Nonetheless, prizes are awarded
- judged against what criteria?

e.g.



STUDENT POSTER PRESENTATION

MARKING MATRIX

- examine the poster thoroughly before scoring content and presentation
- circle the number corresponding to your assessment
- add your marks to provide a total score (out of 50)

STUDENT NAME: .....

TOPIC: .....

	ASSESSMENT				
	bad	poor	average	good	excellent
CONTENT					
- introduction to topic (background context)	1	2	3	4	5
- statement of objectives (aims/hypotheses)	1	2	3	4	5
- overview of relevant materials & methods	1	2	3	4	5
- description and originality of results	1	2	3	4	5
- validity and justification of conclusions	1	2	3	4	5
- recapitulation (summary/review)	1	2	3	4	5
PRESENTATION					
- continuity (logical flow of information)	1	2	3	4	5
- visual clarity (acuity/contrast)	1	2	3	4	5
- relevant graphics (figures/photos)	1	2	3	4	5
- overall design (layout/composition)	1	2	3	4	5
TOTAL (out of 50)					Initials

Software

Microsoft — PowerPoint, Publisher

Adobe — InDesign, Illustrator

PosterGenius

QuarkXPress
LaTeX
Scribus
etc....

PowerPoint

PowerPoint research poster templates
in metric sizes for International poster conferences.
(Thumbnails of posters are shown in proportion to each others' sizes)

(Modern - Windows and Mac PowerPoint)
DOWNLOAD 91cm x 122cm POSTER TEMPLATE-2012

(Classic - Windows and Mac PowerPoint)
DOWNLOAD 91cm x 122cm POSTER TEMPLATE 2003

91cm Wide x 122cm Tall
PowerPoint Poster Template

This free PowerPoint template is designed for a standard metric **91 cm by 122 cm scientific** poster presentation for international poster sessions.

This scientific poster template can also be printed in the following sizes:
91 cm x122 cm (Standard 36x48 inches)
76x102 cm

This PowerPoint poster template is essentially a vertical version of a standard 48x36 inch poster presentation.

PosterGenius

Exemplars

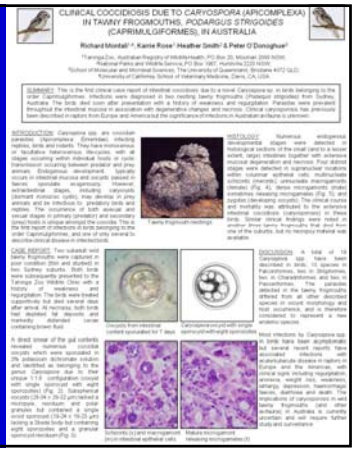
Common faults:

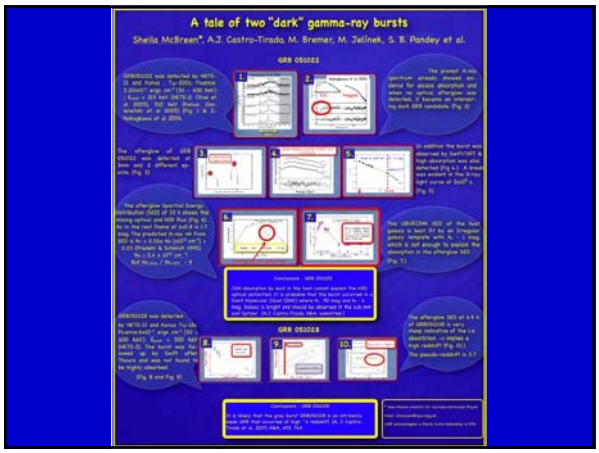
- too too too too too too too too too too too much [text, jargon, methods, graphics, colour, …]
- unclear message, poor continuity / flow

Solutions:

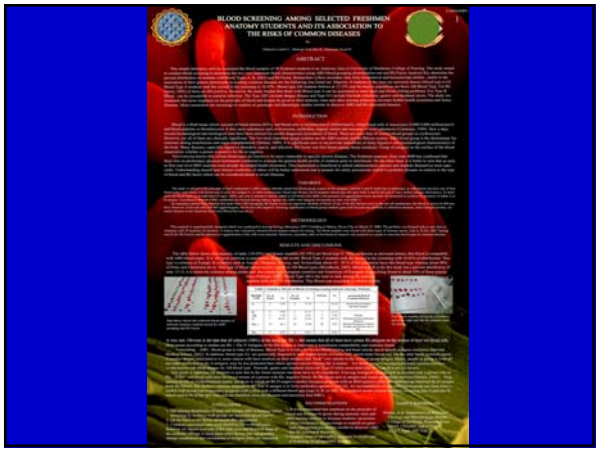
- simplify story board [edit, edit, edit][invite feedback]
- reinforce/highlight core message [flag it!]

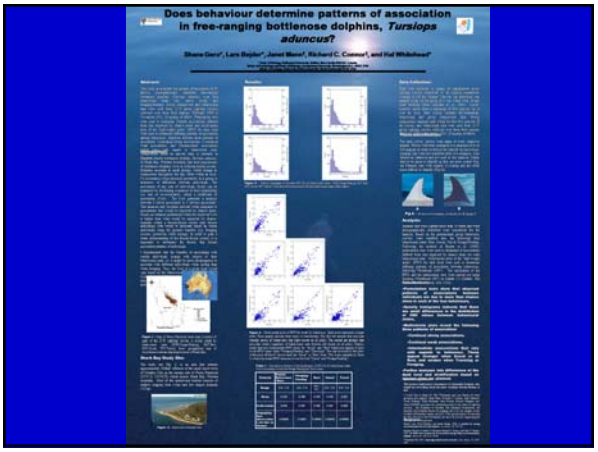
- too much text
- no leaders
- photos too small
- no highlights
- no clear message
- poor flow

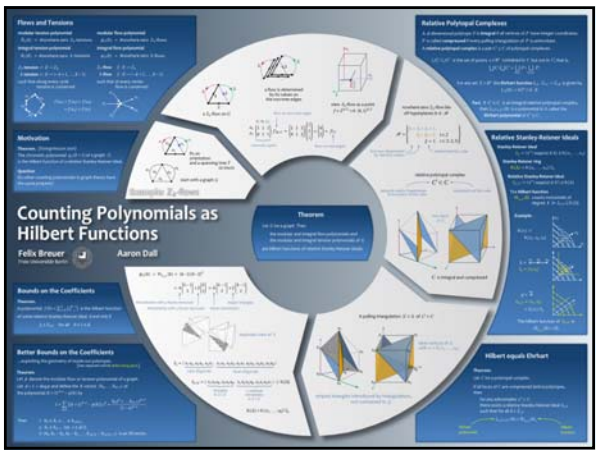



A tale of two "dark" gamma-ray bursts
Sheila McBreen*, A.J. Castro-Tirado, M. Bremer, M. Jelinek, S. B. Pandey et al.
GRB 050202
GRB 050223
Conclusions - GRB 050202
Conclusions - GRB 050223
GRB 050202


Rehabilitation of a Quarter Horse presenting a trauma of the brachial plexus with partial denervation
Abstract
Physical therapy and Rehabilitation
Discussion


BLOOD SCREENING AMONG SELECTED FRESHMEN ANATOMY STUDENTS AND ITS ASSOCIATION TO THE RISKS OF COMMON DISEASES
ABSTRACT
INTRODUCTION
METHODOLOGY
RESULTS AND DISCUSSION


Does behaviour determine patterns of association in free-ranging bottlenose dolphins, Tursiops aduncus?


Counting Polynomials as Hilbert Functions
Felix Breuer
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Flows and Tensions
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Bounds on the Coefficients
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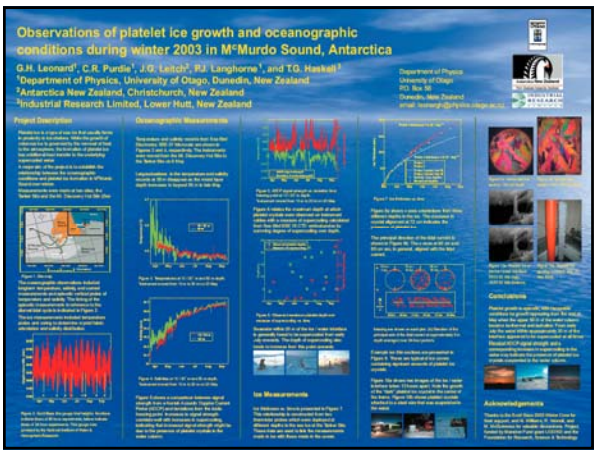
Observations of platelet ice growth and oceanographic conditions during winter 2003 in McMurdo Sound, Antarctica
G.H. Leonard, C.R. Purdie, J.G. Leitch, P.J. Langhorne, and T.G. Haskell
Department of Physics, University of Otago, Dunedin, New Zealand
Antarctica New Zealand, Christchurch, New Zealand
Industrial Research Limited, Lower Hutt, New Zealand
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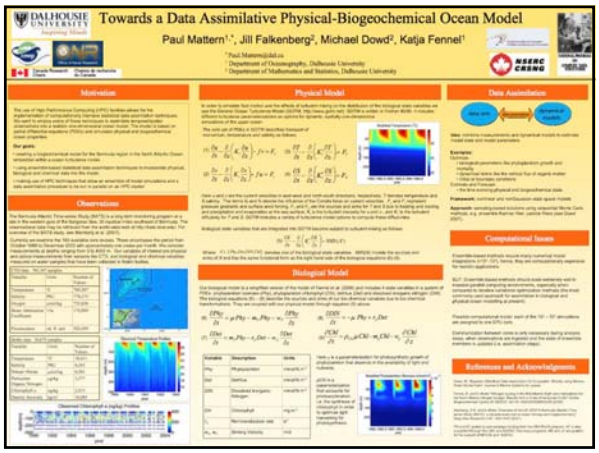
Towards a Data Assimilative Physical-Biogeochemical Ocean Model
Paul Mattern[1,*], Jill Falkenberg[2], Michael Dowd[2], Katja Fennel[1]
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Physical Model
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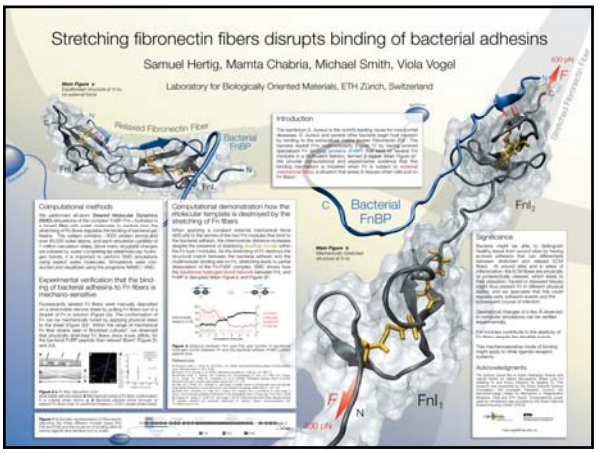
Stretching fibronectin fibers disrupts binding of bacterial adhesins
Samuel Hertig, Mamta Chabria, Michael Smith, Viola Vogel
Laboratory for Biologically Oriented Materials, ETH Zürich, Switzerland
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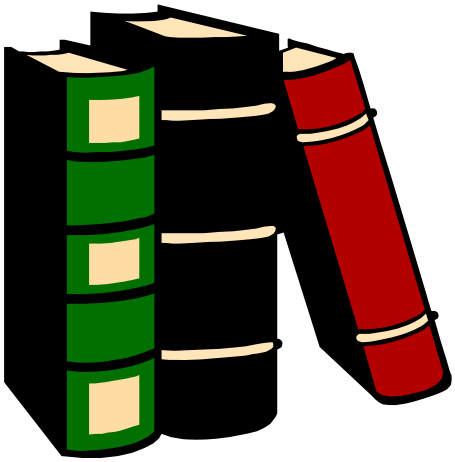
The most successful posters are those that are pretty, engaging, informative and easy to understand!

A Guide to Science Writing

Professor Peter O'Donoghue



Documents	Grant applications
	Scientific papers
	Literature reviews
Approach	Planning
	Reviewing
Writing	Title
	Abstract
	Introduction
	Materials and Methods
	Results (+ Tables + Figures)
	Discussion
	References
Editing	Paragraphs
	Sentences
	Words
	Punctuation
Submission	Editors

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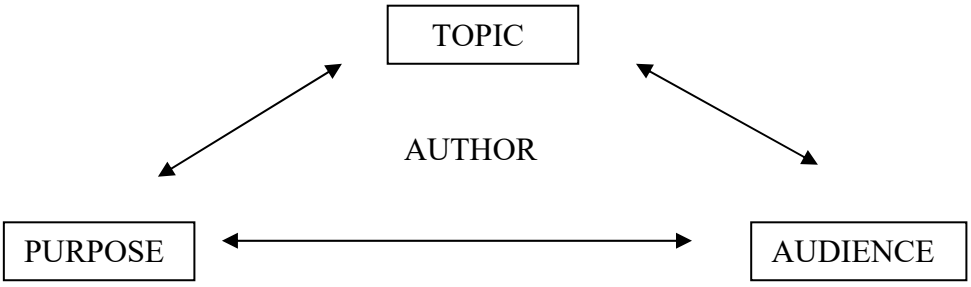
SCIENCE WRITING

Whatever you are writing, you need to bring together writer, topic, purpose and audience. You (the writer) have something you want to say about an incident, person, problem or idea (topic) for a particular reason (purpose) to one or more people (audience). This constitutes the "communications triangle" (Ebbitt, 1982).



Scientists are called upon to write 3 main types of documents:

- grant applications
- scientific papers
- literature reviews.

While the instructions given to authors by granting agencies, publishing houses and editors may differ, there are many common elements to these documents: all three are subject to peer review by independent referees to gauge integrity and quality; they generally adhere to a 'scientific' format (IMRAD = Introduction, Methods, Results and Discussion); and they are mostly written in formal language. Scientists conform to prescribed formats to get material published and they write for other scientists, rather than for the community at large. The growing demand to revise and broaden science communication has created jobs for science writers and knowledge brokers, third parties who are not science specialists but are trained communicators able to simplify and explain science to society.

Grant applications

Governments make funds available each year for scientific research, often in applied priority areas. Various schemes have been developed for project grants, industry partnerships, exchange programs, cooperative research, institutional programs, etc. Securing funds is a fierce competitive process, with significant employment and career consequences. Individuals and organizations invest considerable resources in applying for grants but regrettably, the success rate is low (15-25%). It is, however, the only game in town, so every scientist plays. Grant applications require a catchy title (strong focus), a succinct summary (intelligible to laypersons), specific aims and objectives (logical and contextual), statements of expected outcomes (relevance and impact to society, industry, etc), an itemized budget (with justifications for expenditure) and finally, the actual project proposal (background, methodology, timetable). Applications are reviewed by independent referees, ranked according to specific criteria, and funded expediently (offers made until money runs out). Scientists are often judged on two criteria, grantsmanship (money-in) and authorship (papers-out).

Scientific papers

Libraries are filled with thousands of volumes of scientific journals which contain millions of scientific papers. Most journals are thematic and cater for specific disciplines and audiences. They vary widely in their distribution and availability, roughly half being parochial (regionally specific) and the remainder being international. Scientists submit manuscripts to the journal editors who then send them to independent referees for review.

Articles may be rejected for many reasons (badly written, inexact science, falsehoods, not in context of journal, etc) or accepted for publication after major, minor or no revision. Few journals are free to the authors; most have page charges or reviewer fees. Even with the recent trend towards on-line editing and publishing, there are still fees payable to publishing houses.

Scientists generally write two types of scientific papers: full research papers; or short contributions. Both follow an almost universal prescribed format: title (sufficiently descriptive in its own right), abstract (summary of whole paper), Introduction (background and objectives), Methodology (materials and methods used), Results (observations and experimental findings), Discussion (critical interpretation in context) and references (other works cited).

Short communications are condensed versions of full papers. Scientists spend inordinate amounts of time crafting the abstracts of their papers because they are reproduced in scientific databases and search engines, and are often the only thing other scientists read.

Literature reviews

Due to the overwhelming number and diversity of publications available, many publishing houses now organize and publish literature reviews as journal articles, book chapters, and even whole books. Most reviews are commissioned articles whereby the authors have been invited to prepare and submit a treatise on a particular topic.

The reviews can be critical analyses of contemporary issues, historical summaries of developing fields, personal opinion pieces, or collations of relevant resource materials (databases, catalogues, bibliographies, checklists, etc). Literature reviews provide an ideal starting point for novices to be introduced to a topic. Indeed, all higher degree students are required to write literature reviews to provide background and perspective to their research projects. Professional scientists use reviews to keep apace with recent developments and the authors achieve elevated status as recognized world authorities in the relevant field.

Reviews follow various formats, but essentially they rationalize their existence (justify objectives), summarize previous studies (compare and contrast, pros and cons) and suggest future directions for research.

Approach to writing

Scientific writing can be quite different from other forms of writing, but like all generic skills, it gets better with practice. Many scientists state that their major obstacles to writing are:

- over-justification syndrome (trying to qualify everything)
- exception syndrome (making generalizations but becoming bogged down with all the exceptions to the rule)
- forest-from-trees-syndrome (failing to properly identify scope and content of article)
- beginner's block (not knowing where to start)
- writer's block (people procrastinate by doing something else instead).

Successful writers have identified two strategies that they consider to be exceptionally helpful: doodling on paper (planning) and talking out-loud (reviewing).

Planning

Students often immerse themselves in topics without having developed any writing plan of their own. They quickly become buried in the information overload, often focus on irrelevant items, and become confused by other people's ideas, which are often contradictory. Everyone must develop a plan of attack for the job ahead, whether it is making a shopping list, a holiday itinerary, or a scientific paper.

The best place to start is with a blank piece of paper. Your mind is already mulling over the task ahead and many connections are already being made consciously as well as subconsciously. Writing down those thoughts and ideas whirling through your mind brings structure to your work by identifying scope, sequence and schedule. A similar strategy often employed in tutorial classes is known as concept-mapping. The advantage of using pen and paper to begin with, rather than word-processing computer packages, is that handwritten scribbles are psychologically less daunting and less prescriptive than pretty organized typed text on a computer screen.

Many writers consider using paper to be vital to the brain-storming creative process while keyboards (type-writers and computers) help polish and present product. Simply jotting down main elements in the form of headings (keywords or phrases) allows the writer to identify relevant content, distill the essence of the paper, break down a big onerous task into smaller do-able items and actually begin the task. Subsequent re-arrangement of the headings allows the writer to develop a logical train of thought and provides the framework for the story to be told. Having planned the task and identified the cognate components, writing the rest of the paper is simply a matter of adhering to the plan, filling in the gaps and word-smithing.

Reviewing

An excellent strategy used by many authors is to read their sentences out-loud. Humans have much better verbal skills than writing skills because speaking is the most commonly practiced form of communication and uses much simpler language than written text. Many people advocate the KISS principle (keep it simple, stupid!).

Listening to yourself can bring life to the topic, help moderate language and grammar, de-convolute long complicated sentences, and streamline textual flow. Reading it out loud to someone else has the added advantage of involving an audience and obtaining critical feedback (hopefully constructive rather than destructive).

WRITING GUIDE

The IMRAD sequence has been adopted as an International Standard for reporting experimental science. It is not appropriate for all papers (e.g. reviews) and not all disciplines follow it exactly. Nonetheless, it provides an extremely useful template for organizing material.

Sequence of research	Format and Content	Elements of critical argument
the question to be answered	INTRODUCTION	the problem (question)
how the answer was sought	MATERIALS & METHODS	credibility of evidence
findings of study	RESULTS	evidence (data), initial answer
findings considered in light of other work; the answer	DISCUSSION	supporting/contradictory evidence; assessment; answer

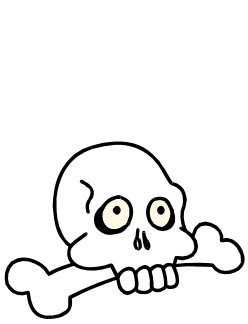
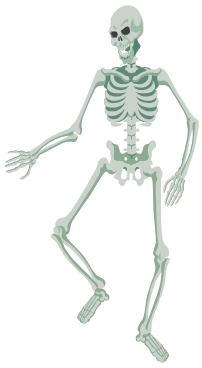
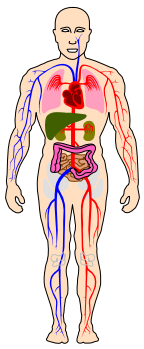
Many authors use a 'hierarchy of headings' to organise outlines of their work, using headings to logically arrange broad general categories and informative subheadings to organise narrower specific subcategories. Strategies used include writing headings (logical categories) on separate pages, listing subheadings in point-style form, identifying keywords within subheadings, and arranging (and re-arranging) material using post-it notes or other cut-n-paste contrivances. Having planned the basic structure and draft content of the paper, it is then important to actually write draft narratives for subheadings. Try writing incrementally – in bits as you go along.

There are many tips for writing first drafts of papers, including:

- choose your best time to write (when you are alert, not tired)
- choose a suitable place (comfortable conditions free of distractions, annoyances)
- tackle the easiest, most factual, sections first
- write quickly to keep your ideas flowing (do not break flow to check material)
- do not worry about spelling, expression or typing mistakes (they can be edited later)
- if you get stuck, drop it and tackle another part (keep putting things down on paper)
- double-space your text (it is more conducive to creativity and easier to edit)
- take a break after about 60 minutes (30 minutes for top concentration).

There has been an explosion in the number of books available as guides to scientific writing. Many profess to be comprehensive and inclusive, even providing templates for budding authors to follow. Regrettably, science communication has not been standardized internationally. Although individual journals and book publishing houses prefer particular styles (available as itemized *Instructions to Authors* on request), they vary from place to place, and even from time to time. The IMRAD format is probably as close to a universal system as we will come, but with many variants. Nobody wants to stifle the creativity and intellectual freedom shown by our authors by demanding adherence to a single rigid format. I liken the creative process of writing scientific papers to using Frankenstein's guide to building a body of knowledge: start with an assortment of bones (relevant items); construct a skeleton (logical framework); flesh it out (add substance); and dress it up (language).

Frankenstein's Guide to Scientific Writing


gather bones	assemble skeleton	flesh it out	dress the body
- identify key components - back-engineer title	- provide logical structure, e.g. - table of contents paragraph headings	- identify specific content - subheadings keywords	- write connecting text - grammar punctuation
Planning phase	Construction phase		Writing phase

A systematic parametric approach to writing not only breaks huge tasks into smaller do-able components, but it also forces you to constantly revise content and sequence. The IMRAD headings provide an ideal starting point for budding authors. The following paragraphs provide information about the content and purpose of the IMRAD headings, followed by helpful hints about grammar and expression.

Title (What is the paper about?)

Describe the subject of the paper in the fewest possible words. Make it concise, accurate, informative and interesting. Remember that the words used in the title act as keywords in searchable computerized databases. Avoid abbreviations and acronyms as they can be variably interpreted. Cut out 'waste' words (e.g. 'the', 'of', 'on'). Do not put a full-stop at the end (a title is not a sentence). The objective of the title is to convey not only the discipline or field of study but also the thrust, direction or essence of the research.

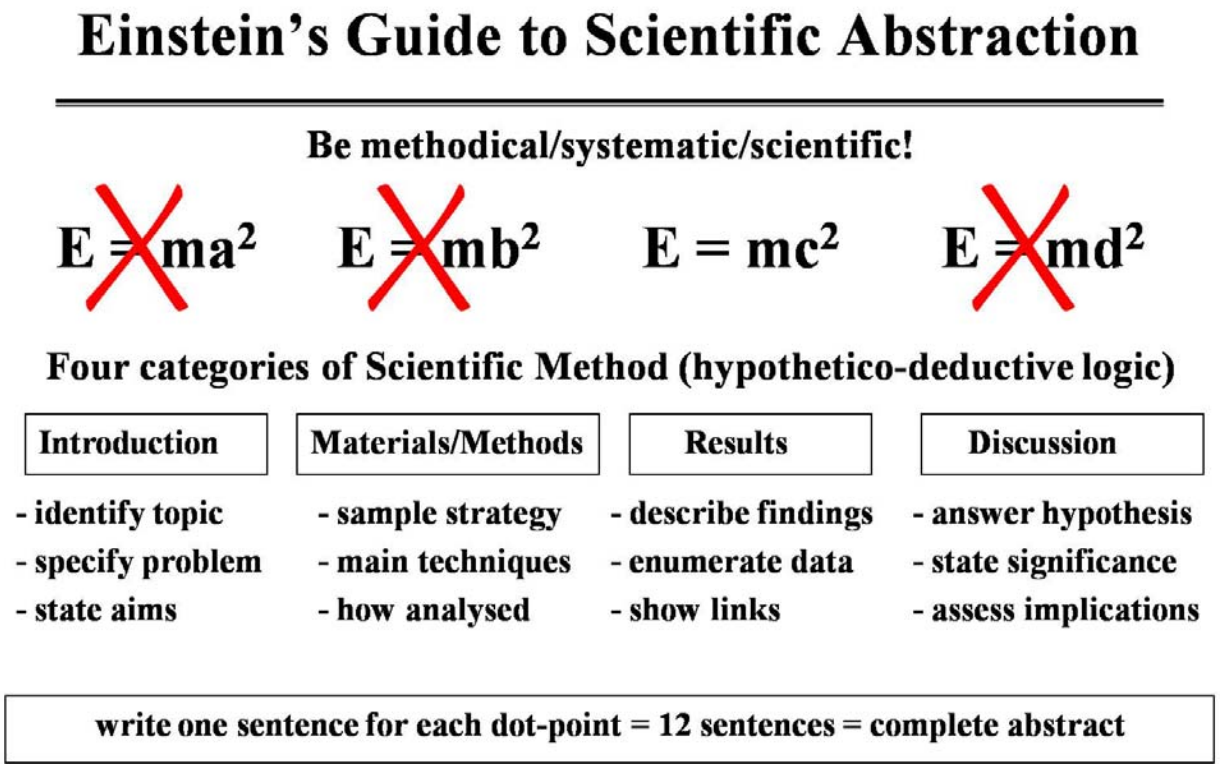
Titles generally follow one of three patterns:

1. summary of topic (e.g. "*Comparison of parasitic infections of sheep and goats in Wales*")
2. summary of findings (e.g. "*Goats have fewer parasites than sheep in Wales*")
3. subject/topic: aspect examined (e.g. "*Parasites of sheep and goats: prevalence in Wales*")

Abstract (Summary of paper)

Few people will ever read the whole text of your paper, but many more will read the abstract to glean information (or to decide whether to read the remainder). Indeed, indexing journals and computer data-bases provide virtually instant access to scientific abstracts. The abstract must stand alone. The information contained must be designed to catch the reader's attention. It should summarize the principal objectives, scope of investigation, main results, principal conclusions, and implications of your findings. Be informative rather than descriptive. Keep sentences short and simple, one topic per sentence. Do not repeat or paraphrase the title. Try to emphasise the different points in proportion to the emphasis they receive in the body of the paper. Do not use unfamiliar terms, acronyms, abbreviations or symbols. Do not cite other work.

Many authors mistakenly try to justify their study in the abstract and provide few details of the work actually performed. Others provide comprehensive results but do not interpret their significance. The abstract must be a compilation of the main points of the whole investigation. Write and edit several drafts of the abstract as it can help you focus on the main points you wish to communicate. Most journals set a word limit for the abstract. Use it all wisely! In an attempt to better standardize and regulate content, some journals have recently introduced structured abstracts (prescriptive templates with subheadings such as Aims, Methods, Results, and Conclusions). Try using headings when writing (you can cut them out later).



Introduction (Background and objectives)

This section should establish not only the problem under investigation but also the relevant background, who/what is affected, what progress has previously been made and briefly what you did. It is a good place to define scientific and technical terms, and some journals even like you to give the main result. The purpose of the Introduction is to supply sufficient background information for the reader to understand and evaluate the results of the paper without needing to read previous publications. You must state the question being addressed but be careful when using the word '*hypothesis'* as it has a specific scientific meaning but is variably interpreted by editors, referees and readers.

Good introductions often fall into three parts.

1. The first states the general field of interest.
2. The second presents the findings of others that will be challenged or developed.
3. The third specifies the question to which the present paper is addressed. It may also indicate by which means the question has been examined, especially if the methods are new or unfamiliar, and may or may not state the conclusions.

The aim throughout should be to excite and interest the reader and answer the question: 'Why was this work embarked upon?' " Anon. 1986 "Scientific Writing for Graduate Students"

Materials and Methods (What was used? How?)

The main purpose is to enable readers to understand how you gathered your data so they could repeat your experiments or compare studies. First describe the experimental design or theoretical approach. State what assumptions you made in designing the experiment. Use subheadings to arrange information (where possible, 'match' subheadings in the Results section).

> Describe the materials precisely and concisely (giving all essentials). Describe geographic areas; include a map if appropriate, with place names, latitude and longitude (no compass point if map is oriented north). Give full taxonomic identification, including source, strain, breed, cultivar or line (give authority for nomenclature). Give characteristics of your sample (number, age, weight, sex, etc).
>
> Describe the methods in logical order and include enough details for reproducibility. If you used a previously published method, refer to it rather than repeat it (but note any modifications). If you have used a new method, describe it in full. Explain any validation or standardization of test procedures (including numbers of replicates, positive and negative controls, and test-to-test variation). Describe experimental conditions using conventional scientific annotation (nevertheless, give compound abbreviations and acronyms in full at first mention). Provide details of all analytical techniques used; stating exactly which statistical tests and computer programs were utilized. Include any criteria used to interpret data.

Results (What were your findings?)

Having conducted your investigation, you need to summarize, analyse and present your findings in a logical coherent fashion. Remember that the results should stand alone as text, and only be supported by tables and figures as required for illustrative purposes (it is never sufficient to say "*The results are shown in Table X*"). Use draft tables and figures to decide upon the best order to present your results, beginning with the main findings and scaling down to subordinate material. Write the text independently of the illustrations, and then decide which tables and/or figures deserve inclusion as supporting material (usually you will generate many more than can be included so you need to make judicious choices). Do not repeat figure or table legends in the text. Exclude irrelevant results, but do not suppress valid results that appear to contradict your hypothesis (use the discussion to explain the anomaly). Make it clear how your results relate to your argument.

Remember to be quantitative rather than qualitative by enumerating data and completing comparative phrases (e.g. "*infections were more prevalent in winter*" is less clear than "*infections were more prevalent in winter (75%) than in summer (50%)*". Include the statistical significance of differences where appropriate, showing test and probability (e.g. $F = 2.34$, $p = 0.04$). State the number of measurements (e.g. $n = 120$) and use standard deviation to show variability among individuals, while standard error shows the precision of the sample mean. Do not attempt to validate, interpret or discuss your findings in the results section, simply report the facts.

Tables (rows by columns): Use tables wisely - they do not supplant text, and they should not present raw or complex data sets. Instead, they should provide clear guides to data summaries or trends. Because you present material in neighbouring columns and/or rows, they are ideal for comparative purposes. Do not clutter them by using too many lines, grids, fancy borders or shading (avoid default styles in computerized packages). Follow the style guides given by the journal "Instructions to Authors" (or copy styles they have used previously). Refer to the table in the text before giving the table. Ensure that the legend is accurate and succinct (preferably explain any abbreviations in footnotes). Give numbers to an appropriate degree of accuracy (do not imply greater precision than you achieved with your measurements).

Figures (graphs, charts, maps, drawings, photographs): Authors use figures for a variety of purposes: as visual aids to the understanding of complex concepts; proof of existence; summaries of analyses; stylistic renditions of complex or cryptic entities; or simply as representative illustrations of items, places or procedures. They are best used to present data for which trends or proportions are important characteristics. They do not supplant text and should not be used as subject or object within sentences (best included as ancillary material): e.g. rather than saying "*Fig. 5 shows infections lasted 20 days*", say "*Infections lasted 20 days (Fig. 5)*". Graphs should not contain too many lines (norm is 3 to 4 curves) and all axes should be scaled and labelled (including units). Make sure the reader can discriminate between individual plots by using contrasting lines and/or data-points. Avoid colour unless it is the norm for the journal (bear in mind that most journals charge authors for colour reproductions). Make sure photographs clearly show intended features and use annotations to highlight items.

Discussion (What does it all mean?)

Many writers introduce their work satisfactorily, describe their methods adequately and arrange their results in logical order, but become overwhelmed by the Discussion section. To some, this all-inclusive heading is an invitation to wax verbose, to expound at length and in detail, and perhaps pontificate a bit. This is not a good way to communicate your science.

A frequent fault is the verbatim, or nearly verbatim, repetition of statements from the Results section, which the authors believe to be necessary to formally bring up each topic for discussion. A special example is provided by the 'converted thesis', in which the writer successively examines various possibilities in detail and then in equal detail shows how they could not possibly apply to the work at hand. The result is a distinctive roller-coaster pattern that offers no informed or constructive critical interpretation of material. No panacea is offered here. The Discussion is often the most difficult section to prepare and calls for careful thought and concise, coherent composition.

Make sure you answer the question(s) stated in your Introduction (try using the end of the Introduction as your starting point). Discuss, but do not recapitulate, your results. Provide contextual relevance not only within your field of study but also within a broader scientific context. Make it comparative by showing how your findings and interpretations agree (or contrast) with previously published work. Do not shy from critical interpretation, but be constructive rather than destructive. Distinguish between facts and speculation. Use the past tense for results and the present tense for general statements. Discuss the theoretical implications as well as the practical. State your conclusion(s) as clearly as possible. Indicate where the work could go next (but avoid the clichéd "*Further research is required*")

References

Plagiarism comes from the Latin for kidnapper. By 1646 it referred to literary theft, passing off someone else's words and thoughts as one's own. Make sure you cite relevant references in the text when including someone else's work (whether quoting, paraphrasing or simply mentioning it). Widely known facts or ideas do not need a reference (e.g. "*Many worms are parasites*"), whereas facts that are not common knowledge do (e.g. "*Necator is a parasitic hookworm (Smith, 2005)*"). Pay scrupulous attention to the style and accuracy of all your references (in text and listed at end) because the journal referees and editors will (most making the assumption that sloppy referencing is indicative of sloppy and substandard research).

Cite references in the text as follows - one author: Smith, 2005; two authors: Smith & Jones, 2005; three or more authors: Smith *et al*., 2005. Many editors have a pet-hate for the inappropriate use of *et al*. (abbreviation for Latin *et alia* meaning 'and others'). Include only those references cited in-text in the List of References (it is not a bibliography). Follow the citation format recommended by the journal (most use an International Standardized List of Periodical Abbreviations).

Editing

The first draft of your manuscript is complete . . . your co-author, manager or supervisor has asked to have a look. *REFUSE!*

If your first draft is like most first drafts, you will get it back full of despairing red ink; you will have established your reputation as a bad writer. No matter how clearly you tell people "this is only a rough draft", they will treat it as a final draft. Do not give your manuscript to anyone until you have finished editing it for structure and style.

It is very difficult to read any paper to check its content, structure and argument and at the same time check its grammar and expression – the first requires you to step back and take a broad view ("structural editing"); the second requires detailed word-by-word study ("stylistic editing"). This means you will have to edit at least twice to do a good job (most authors go through 4-5 drafts to craft their manuscript before submission, and are still required to revise portions before acceptance for publication).

There are many tips for editing manuscripts; including the following step-wise approach:

1. Put your first draft away for several days (return to it with fresh eyes)
2. Print your manuscript double-spaced and work on the paper copy (forget about editing on screen).
3. Read it out loud (for comprehension and continuity)
4. Compare your tables with each other; do the same for the figures (checking for consistency in style and accuracy).
5. Edit for content, structure and argument ("structural editing")
6. Edit for grammar and expression ("stylistic editing")
7. Finish it off by checking tedious details (e.g. referencing)
8. Give it to people to read (and graciously accept any suggested corrections – after all, you asked for them!).

Beware of computerized spelling and grammar checkers – they include many different versions of English dictionaries (most defaulting to American versions); they do not differentiate between different forms of spelling; they do not check for meaning; and they apply punctuation rules without making informed judgements.

I have a spelling checker
It came with my PC
It plainly marks for my revue
Mistakes I cannot sea.
I've run this poem through it,
I'm sure your please to no,
Its letter perfect in it's weigh,
My checker tolled me sew.

Paragraphs are units of thought, not units of length; "one idea – one paragraph". They offer readers manageable segments of information, give visual clues to the transition between thoughts or ideas, and provide pauses to absorb information. The first sentence of a paragraph usually tells you what the paragraph will be about (= topic sentence). The rest of the paragraph expands on the topic and the last sentence rounds it off (it can also be a connecting sentence pointing to where the next paragraph will be going). If you simply read out loud the first sentences of every paragraph of your paper, and still understand the crux of the paper, you have done a good job. Avoid jerky paragraphs. The sentences should hang together so the reader progresses smoothly through the paragraph. Continuity is best provided by using two characteristics of English sentences: noting that the stress positions of a sentence are at the beginning and end; and using this to place the topic of the sentence at the beginning and new information at the end; e.g.

-

-continuous flow:

"*Her condition is still serious, but is improving. She therefore expects to leave hospital soon*".

topic → new info topic → new info

-discontinuous flow:

"*Her condition is still serious, but is improving. Returning to work is not yet likely, however*".

topic → new info new info ← topic

Sentences fall into one of six patterns (remember that an 'independent clause' is one that could stand alone as a sentence, a 'dependent clause' cannot).

1. Simple sentences have one independent clause containing a subject and a verb, and sometimes also an object or predicate adjective. Used to make an unqualified observation; e.g. "*The door leads to the garden*".

2. Compound sentences have two or more independent clauses joined with a comma or coordinating conjunction (*and, or, but, for, nor, so, yet*), a semicolon, or a semicolon and coordinating adverb (*however, therefore, this, moreover, nevertheless*). Used to make two (or more) unqualified observations, often in comparison and contrast; e.g. "*The door leads to the garden, but it is hard to open*".

3. Complex sentences contain one independent clause and one or more dependent clauses (which act as qualifiers). Adds a qualification or subordinate idea to an observation; e.g. "*Although the door led to the garden, she could not open it*".

4. Compound-complex sentences have at least two independent clauses and one dependent clause. Presents two primary observations, one or both of which are qualified; e.g. "*She could not open the door to the garden, it was made of iron and had rusted shut*".

5. Exclamations are short sentences that may be calls, shouts, utterances, interjections or imperative commands; e.g. "*Shut that door!*"

6. Questions are sentences addressed to a person in order to prompt an answer (actual or rhetorical); e.g. "*Who said that?"*

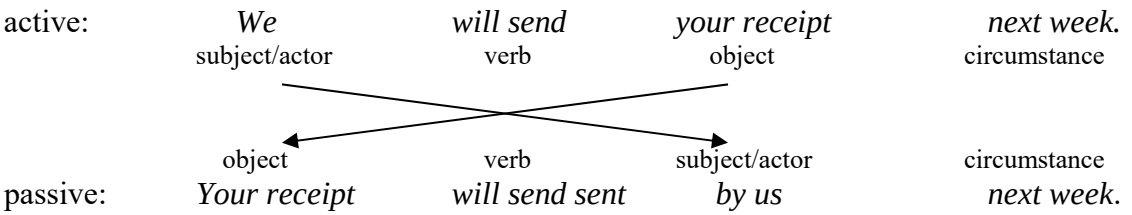
As a general rule, you should follow the "subject-verb-object" (or "topic-verb-new information") pattern for constructing sentences. Put the topic at the beginning, less important information in the middle and "new" information at the end of the sentence. Avoid upside-down and inside-out sentences: such as;

"*Have the students make mobiles, and then hang them in the classroom*"
or the following classic from the Brisbane Courier-Mail
"*A section of wing fell off a 747 on a flight from Manila to San Francisco. It returned and landed safely at Manila*".

Most science is written in passive rather than active voice. Writing in the active voice does not necessarily mean using the first person (singular *I* or plural *we*). There are lots of other actors (or agents): e.g.

passive voice "Spectroscopy *was used to determine* the colour."
active voice "Spectroscopy *determined* the colour".

Regardless, if a sentence is less awkward with *I* or *we* as the agent, use it (albeit sparingly). Most journals now regard prohibitions against first person active as out-dated, but most papers still only contain a few of these pronouns. Passive voice reverses the natural sentence order, so is less straightforward. Scientists often prefer passive voice because it need not state the agent, gives an air of objectivity, and sounds authorative. Regrettably, it can lead to grammatical mistakes, dull prose, misunderstanding, ambiguity, circumlocution and longer sentences. Unfortunately, passive voice becomes a habit, and writers use it relentlessly.



Avoid inordinately long sentences as they tend to confuse issues rather than clarify them. Make sure the logical train of thought you want the reader to follow is transparent and obvious. Use concise focussed sentences to do so (KISS principle!).

Use parallel structures to organize information (parts of a sentence similar in meaning should be similar in construction): e.g. rather than stating "*The prevalence in the Australian sample was 25% and 30% in the New Zealand sample*", say "*The prevalence in the Australian sample was 25% and that in the New Zealand sample was 30%*". If you carefully establish a pattern that the reader expects you to continue, do not break it without good reason. Do not be afraid to repeat words, phrases or even sentences. Repeating is better than confusing. Many of us are taught to make our writing "more interesting" by using synonyms, paraphrasing, or saying it another way. There is no place for elegant variation in scientific writing! Do not force the reader to back-track to find meaning. Avoid transpositional instructions like "*as previously described*", "*stated earlier*", and "*given in section 2.1.1*". "*Former*" and "*latter*" can be used with only two items; use "*first*", "*second*", "*third*" / "*last*" with more items, but do not tax your reader.

Word choice is critical. Stick to plain, not posh, English. Choose plain words your readers are likely to understand (simple nouns, lively verbs, clear adjectives): e.g. "*Keep up your bright swords, for the dew will rust them*" rather than "*Relinquish your luminous armoury, for the atmospheric moisture would cause its deterioration*"). Proper nouns pose few problems, except when they are coupled together to form long noun strings (avoid compound nouns, or hyphenate them for clarity).

Abbreviations and acronyms ("alphabet soup") should only be used if they are generally known (e.g. WHO = World Health Organization) or common in specific fields (in immunology, CFT = Complement Fixation Test). Beware excessive jargon, you might end up with whole sentences (e.g. ELISA PAGE AIDS FISH = Enzyme-Linked Immuno-Sorbent Assay, Poly-Acrylamide Gel Electrophoresis, Acquired Immuno-Deficiency Syndrome, Fluorescent In Situ Hybridization).

Abstract nouns refer to qualities, states or actions (e.g. *honesty*, *knowledge*, *destruction*). We cannot do without them, but far too often they are simply smothered verbs. Many abstract nouns made from verbs end in *–ment, -tion, -sion* or *–sis* (e.g. "*acquisition"* is the noun, "*acquire*" is the verb). Sentences can be simplified by uncovering these verbs; e.g. "*The addition of X made an improvement to Y*" can be simplified to "*Adding X improved Y*"). Too many words can lead to windbaggery. Cut out the empty words. The italicized words in the following examples can be deleted: elliptical *in shape*; fewer *in number*; green *in colour*; in *the month of* June; research *activity*. We also use many phrases where a single word would suffice; e.g. change "*owing to the fact that*" to "*because*"; change "*as regards the matter of*" to "*about*".

Many words in the English are derived from other languages, and may have unusual plural forms: e.g. singular/plural = *datum/data, agendum/agenda, genus/genera, criterion/criteria, larva/larvae, phenomenon/phenomena, medium/media, memorandum/memoranda, bacterium/bacteria, curriculum/curricula, maximum/maxima, ovum/ova, operculum/opercula*. Other words use the standard English plural (adding an *s* or *es*) e.g. *hippopotamuses*, *prospectuses*, *platypuses*, *apparatuses*, *forums* (in the 1980s, *fora* became fashionable, despite it having been *forums* since 1460 – we have even come across *foras*). Other vacillate, usually depending on a difference in meaning (e.g. *appendices* in books, *appendixes* in the body; *indexes* in books, *indices* in mathematics) or on a whim (e.g. *aquaria* or *aquariums*, *referendums* or *referenda*).

If you are unsure of a word (its spelling or more importantly, its meaning), either do not use it, or look it up in a dictionary (one relevant to your brand of English). Words that are commonly mis-used/mis-spelled include:

- *complement* (completes, add to) v. *compliment* (flattering expression)
- *effect* (bring about) v. *affect* (change in some way)
- *principle* (idea, theory, basis) v. *principal* (chief, main)
- *proceed* (go forward) v. *precede* (go before)

Punctuation began with the Greeks, who used it to break up written text into discrete units of thought or argument (they did not split up words with spaces because the word endings indicated the end of the word, and their lines of text often ran in alternate directions). If an ancient Greek had been writing modern English, the opening of the American Constitution would have looked like this:

REDRONISETATSDETINUEHTFOELPOEPEHTEW
TOFORMAMOREPERFECTUNIONESTABLISH

Punctuation was developed to help people read out loud; in previous centuries, sentences had lots of commas and dashes to indicate pauses. We seldom read out loud now, so the modern method is to punctuate only where necessary for logic.

> "*In conversation you can use timing, a look, inflection, pauses. But on the page all you have is commas, dashes, the number of syllables in a word. When I write, I read everything out loud to get the right rhythm. [Fran Lebowitz]*

The full-stop (.) marks the end of a sentence.
It signifies to the reader to take a pause to consider what has been read before moving onto new ideas or thoughts. Do not use it after phrases (such as titles and headings).

The comma (,) marks off discrete sections of a sentence.
It parcels up the bits that belong together and keeps them apart from the bits to which they do not belong. Commas help the reader follow your thinking.

Use commas:

- before and after any element (e.g. a dependent clause, a comment) that interrupts the sentence: e.g. "*The water was, however, quite drinkable*".
- before and after a clause or a phrase that gives more information about the noun it follows: e.g. "*The mole, which spends nearly all its life underground, has very poor vision*".
- two separate clauses linked by a conjunction (e.g. *and, as, but, for, or*) when the first clause is long or the comma is needed to avoid ambiguity. e.g. "*When John left, the house was locked up securely"*.

Do not use commas:

- before (or on either side of) a clause that defines and restricts the noun it follows: e.g. "*Consider the Pei matrix that is positive definite*" asks you to focus on one matrix from among several, whereas "*Consider the Pei matrix, which is positive definite*" gives additional information about that specific matrix [Tip: if it needs a comma, use *which*].
- between independent clauses (i.e. sentences); use a full-stop (or a semi-colon). e.g. the comma in the following sentence should be replaced by a full-stop "*They could not go on, the road was blocked by a fallen tree*".
- between the subject and the verb (even if the subject is very long). e.g. the comma in the following sentence should be deleted "*Increased turbidity due to high levels of suspended solids or algal blooms and shading due to excessive epiphyte growth, are suggested as causative factors*".

The colon (:) indicates the concept "as follows".
Information provided after the colon amplifies or explains what came before. If used to introduce a list, you need not add a dash. Do not start the word after the colon with a capital letter (common in some publishing houses, especially in the USA).

e.g. "*You should remember one thing: do not fool with acid*".

The semicolon (;) both separates and combines. Use it to:

- join two closely related sentences ("independent clauses") when you want to show the two sets of keywords are balanced or mirror each other. It creates a kind of suspended pause (a full-stop would also be correct).
  e.g. "*Down came the rain; up went the umbrellas*".
- separate independent clauses joined by conjunctions (such as *accordingly, also, consequently, furthermore, hence, however, moreover, nevertheless, otherwise, still, therefore, thus*)
  e.g/ "*The water was quire drinkable; however, it was very salty"*.
- separate items in a complex list if you have already used the comma.
  e.g. "*He needed several items: a long, strong piece of string; a toy cart; and a cloth*".
- separate elements of a series that are too long or complex for commas.
  e.g. "*Parking spaces reserved for handicapped persons should be close to building entrances; pathways should be level; and curbs should have ramps"*.

You do not need semicolons if you use bullets for items in a series (and you do not need to add '*and'* before the last item).

The hyphen (-) is used to show that two or more words are to be treated as a single unit.
Many compound words join together using hyphens (e.g. *life-cycle*, *mother-in-law*), although Americans and Australians tend to drop the hyphen in some words more rapidly that the British (e.g. *seagrass* v. *sea-grass*, *cooperate* v. *co-operate*). Use hyphens when two or more nouns, or an adjective and a noun, are put in front of another noun: e.g. *colour-blind men, red-hot stove, signal-to-noise ratio*). Do not hyphenate prefixes unless you need to do so for pronunciation or sense (e.g. Smith *resigned* from the Broncos, but has now *re-signed*").

The apostrophe (') indicates something that has been left out (e.g. *it's = it is; don't = do not*).
Letters used to be added to the end of the word to show what role the word played in a sentence, but most of these signals have now disappeared. The possessive was originally indicated by adding *–es* to a noun:

e.g. *Johannes house* meant *the house that belongs to John*, i.e. *John's house*).

The *e* in *–es* vanished, but the apostrophe replaced it.

The *apostrophe plus s* ('s) indicates ownership or possession. Pronouns have a special form to indicate ownership (*my, your, her, his, its, own, their*), so they do not use the apostrophe. If a noun that 'owns' the idea or object is singular, put *'s* at the end. If it is plural (and therefore already ends in an *s* or *x*), put *'* alone (except for irregular plurals, such as *women, men, sheep*, then put *'s*).

Submission

After several drafts and much editing, you now have a manuscript ready for submission to your chosen journal. Presumably you have written the manuscript in the style and format required for that particular journal. Double-check that you have followed the *Instructions to Authors* exactly (many journal provide a check-list for authors). Triple-check your references. Compose a letter to the editor to accompany the manuscript. Address the editor by name and briefly provide your reasons for submitting your manuscript. Remember, almost one quarter of manuscripts are rejected outright because they were not in the scope or context of the journal (this is generally your fault, reflecting your poor choice of journal). Another quarter is often directly rejected by editors after their subjective assessment of poor quality, limited content, incorrect science or bad presentation. The remaining manuscripts make it through to the next stage of the assessment process.

Editors send out suitable manuscripts for peer review (to 2-3 independent referees who usually have established credentials in your field of study). Referees are not paid for the privilege of reading your paper. Humans are psychologically habituated to proffering criticism on written drafts, so they will invariably find something to criticize or correct. When you receive the referees' comments, resist the temptation to hit back – it achieves nothing. Carefully evaluate all comments, remembering that reviewers are proxies for future readers. If they have misunderstood you, the chances are other readers will too. Revise your manuscript accordingly, or provide an explanation to the editor why you have not revised particular items. If matters cannot be resolved, ask if the paper could be sent to another reviewer. As a last recourse, you can withdraw your manuscript from that journal and submit it elsewhere.

Having invested considerable time, effort, energy and angst into preparing a manuscript, it is still immensely gratifying and satisfying when your paper is published in the scientific literature. It generates an immense sense of accomplishment and pride whenever your papers are accepted and you finally see them in print..