Section	Question	Approx. length
Title	What is the take-home message of your research?	12 — 15 words (< 85 characters, including spaces)
Abstract	What are the goal, key findings, and impact of the project?	125 — 200 words
Introduction	What did you know before beginning the project?	500 — 750 words
Methods	What did you actually do?	1,000 — 1,250 words
Results	What did you observe?	750 words, with five to seven illustrations
Discussion	What does it all mean?	750 words
Acknowledgments	Who helped make this research possible?	150 words

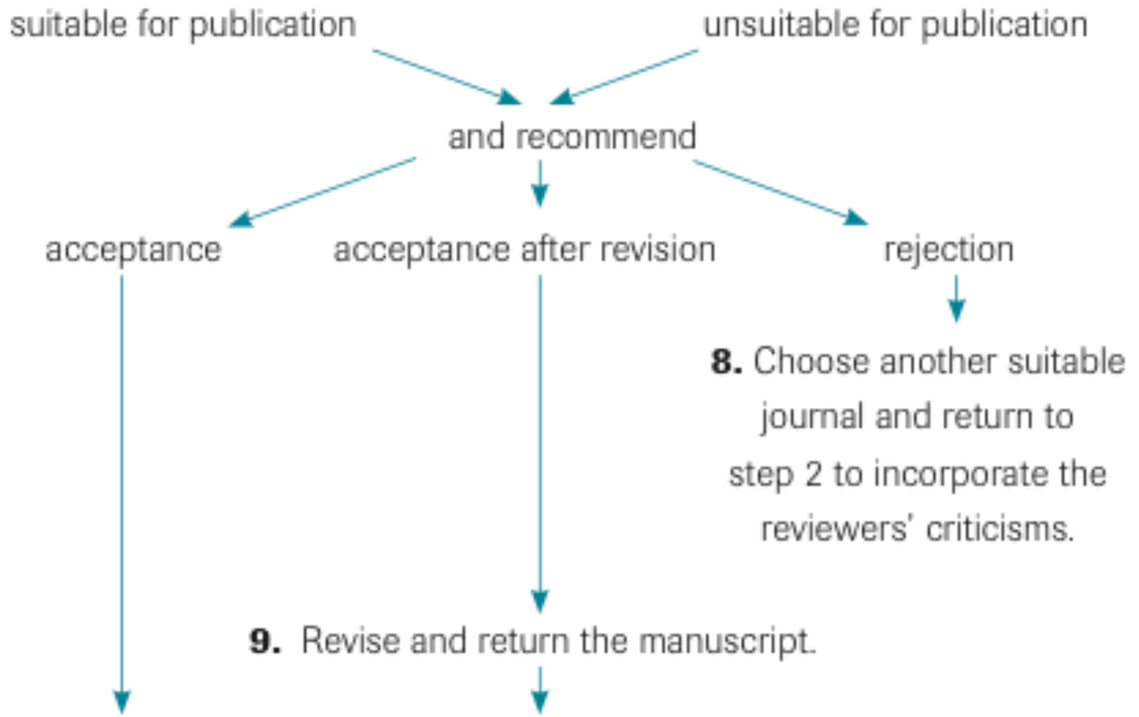
adapted from Roldan, Pardue, 2016. Writing in Biology, A Brief Guide, Oxford University Press, NY, http:// www.oup.com, p. 14 Table 2.1.

*After writing the **results**, a scientist or researcher might move on to the **methods** because the section generally requires gathering nitty-gritty details; to the **introduction** because she has a clearer idea of what a reader needs to know to understand the project; and then to the **discussion** because elaborating on the implications is a natural way to extend the context of the **introduction** and the story of the **results**.*

adapted from Roldan, Pardue, 2016. Writing in Biology, A Brief Guide, Oxford University Press, NY, http:// www.oup.com, p. 15

Steps in constructing a scientific manuscript

1. Choose a suitable journal.
2. Write, read and improve the manuscript.
3. Give the complete manuscript to friends or colleagues and ask them to read it critically.
4. Examine their comments, criticisms and suggestions and modify the manuscript *accordingly*. Read the manuscript again with great care.
5. Submit the manuscript using the chosen journal's on-line submission software.
6. The editor of the journal sends the manuscript out for peer review.
7. The reviewers find the manuscript:



10. The journal editor accepts the manuscript and sends it to the publisher for copywriting, typesetting and layout.
11. The manuscript appears on-line as the submitted pdf file.
12. The journal sends the printer's proofs. Correct and return them as quickly as possible.
13. The manuscript appears on-line and, unless it is solely an on-line journal, shortly after in print.

Sample from Tim Skern, Writing Scientific English, 2011 Box 4.1 The steps in constructing and publishing a scientific manuscript. p. 110/ **Methods**

Tim Skern, in his book, **Writing Scientific English**, claims;

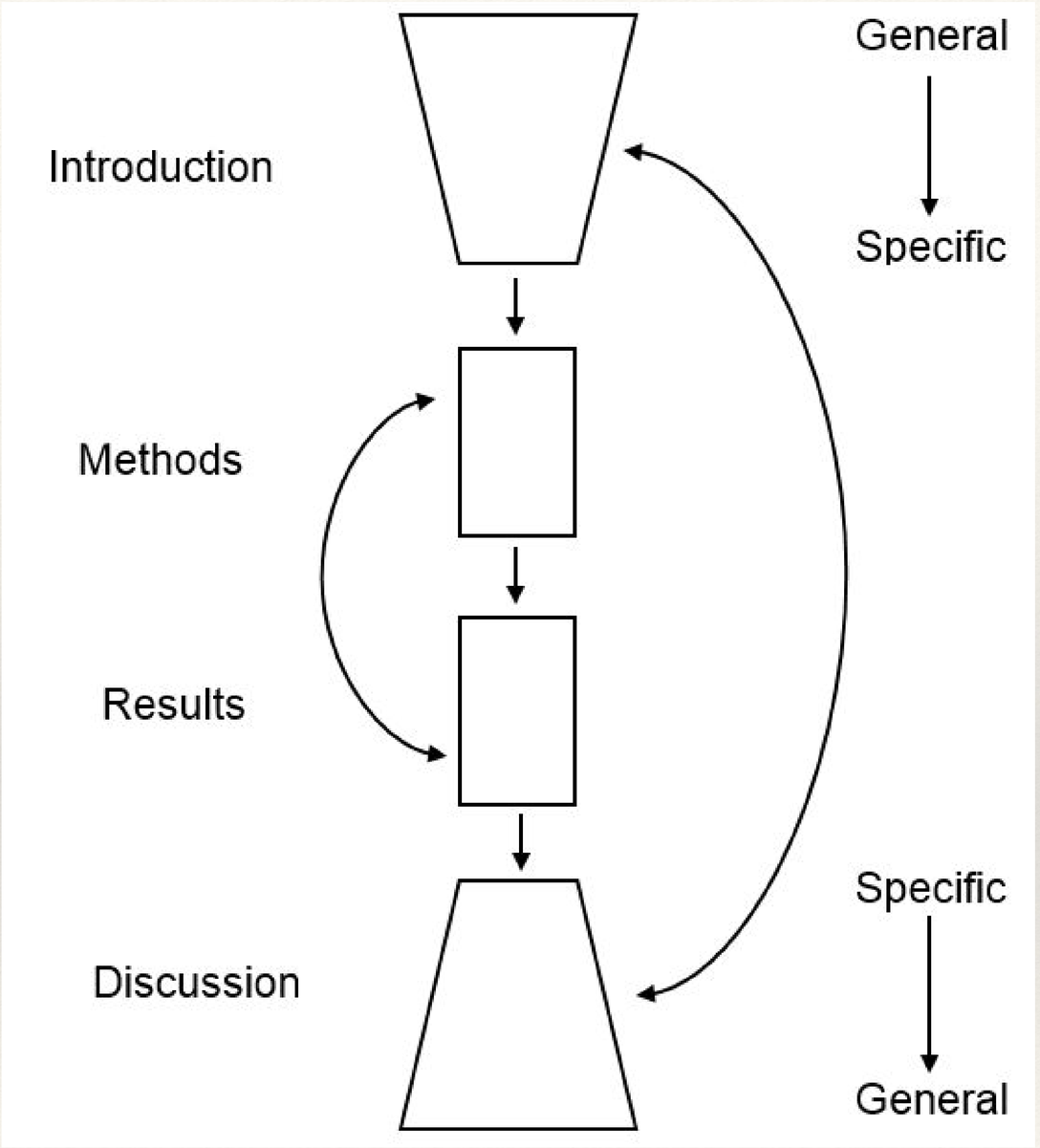
> The results section answers the questions “What did I do and what did I find out?” In essence, the text of the results section should provide just enough information to understand the interpretation of each *experiment* and the rationale why the next experiment was set up.

The results section answers the questions; *"What did I do and what did I find out?"*

He goes on to say;

...while the **methods** section answers the question: *How?*

All further explanation should be reserved for the "discussion" section.



Swales & Feak, p.125

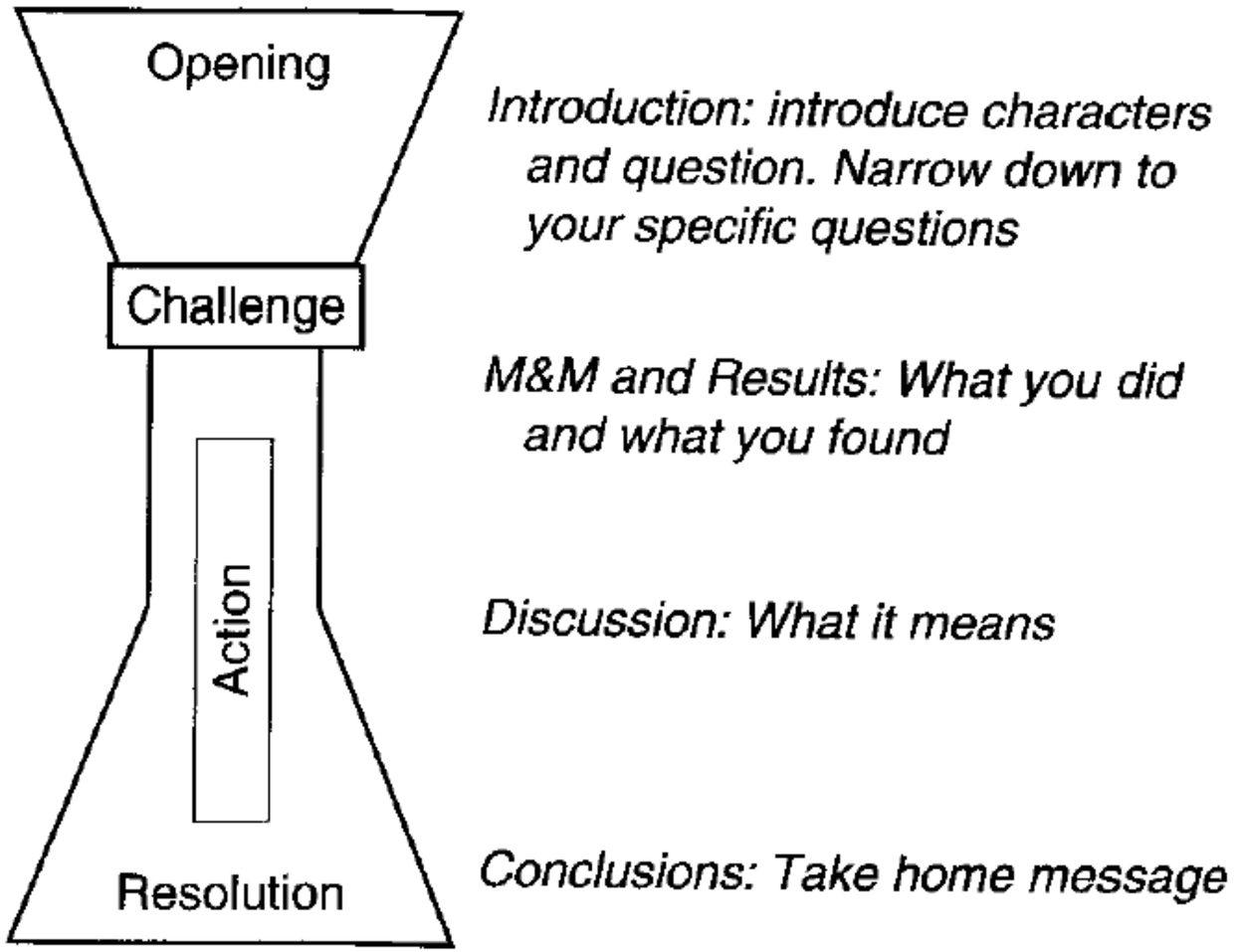


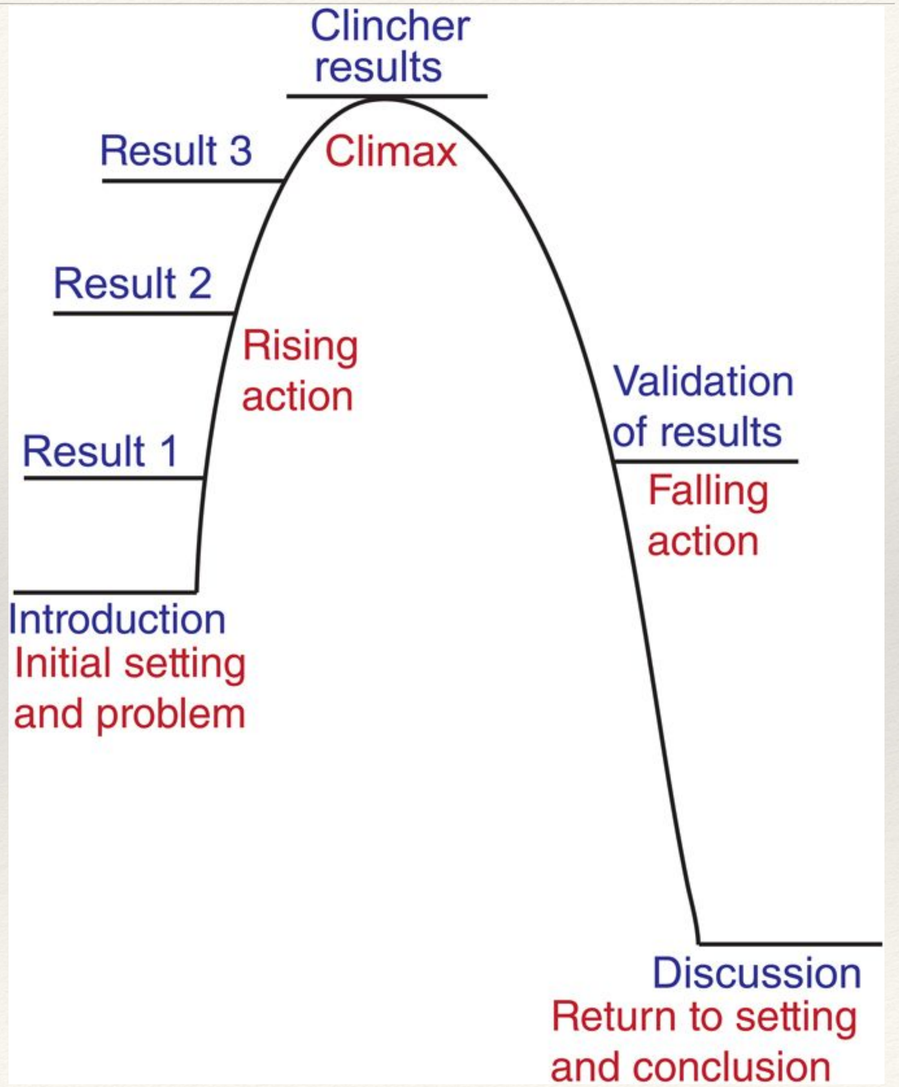
Figure 4.2. The hourglass structure of a paper. It starts wide with the opening, narrows with the challenge and action, and widens back out again at the resolution.

Schimmel, Joshua, 2012. Writing Science: How to write papers that get cited and proposals that get funded, p.33.

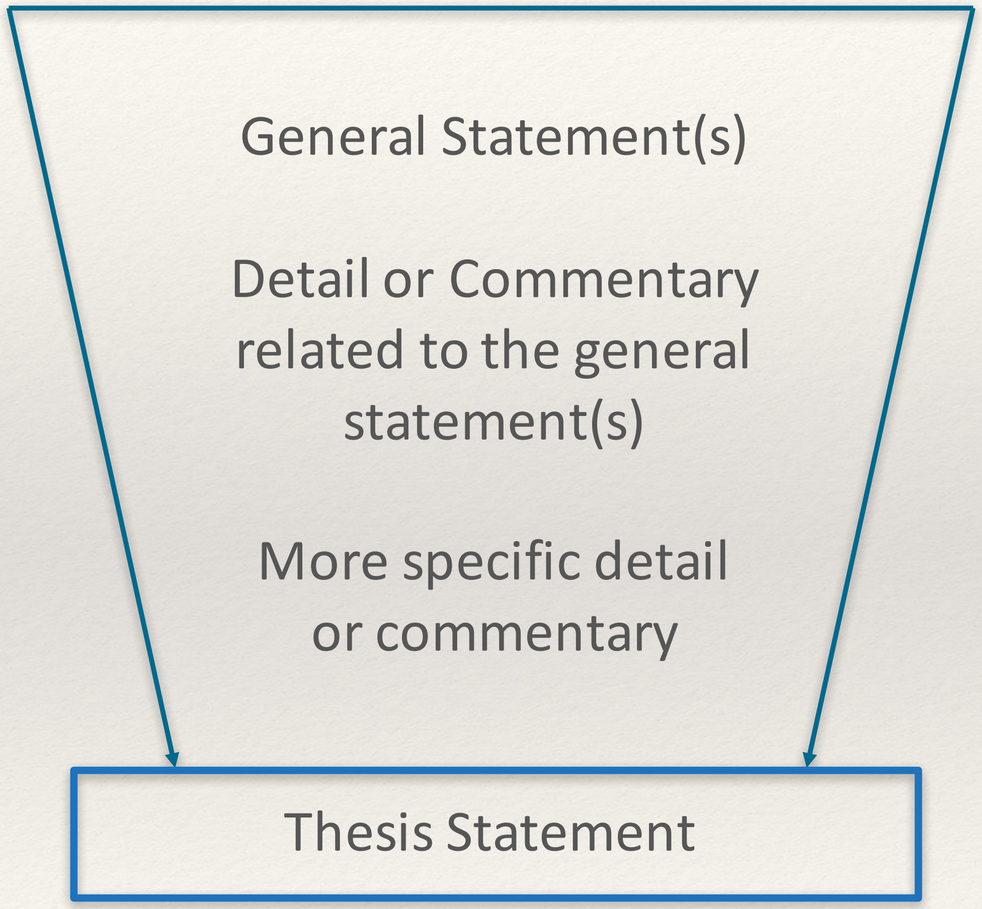
Telling a scientific story using the dramatic arc

The data of the research can be summarized along an outline of a dramatic arc that resembles an energy-of-activation curve. This analogy resonates with the writing process.

Raphael Luna, The Art of Scientific Storytelling, Amado International, 2013.



introductory paragraph: shape



Adapted from Swales and Feak. 2011. *Creating Contexts*. 3.

stating your research aims

- What question(s) will your research answer?
- How does your research project add to, further or challenge the existing literature?
- What is your purpose in undertaking this research?
- What do you expect to discover?

Mapping a relationship to existing research

This study, paper, dissertation, approach is:	*This, Our study, My approach:*
comparable to compatible with consistent with in contrast to in line with significantly different (to/from) the first of its kind very similar (to) unlike	broadens challenges corresponds to differs (from) extends expands provides insight into supports verifies

FOR WHOM?
READER EXPECTATIONS

1) to understand what the author's purpose is in writing the paper

2) to understand what the author is describing or analyzing

3) to decide the relevance of the author's work to their own context

4) to be able to judge the claims that the author is making

5) to be directed to work of a similar nature in the literature

6) to establish how the author's work compares with previous related studies

7) to incorporate new ways of addressing a certain problem

Box 4.3 Sections of a scientific manuscript and the information they contain

- Title page (Title, affiliations, abbreviations and keywords)
- Abstract, summary or synopsis (Take-home message)
- Introduction (What is my theme and why am I interested in it?)

Your introduction *what are the elements?*

- naming the problem or question
- providing definitions – key words
- describing the structure of essay
- naming the research gap
- giving historical background
- stating your reason for writing

Your conclusion *what are the elements?*

- calling for action
- making a recommendation
- offering future perspectives
- predicting the outcomes
- suggesting solutions
- asking more questions

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- References (Whose work is my research based on?)
- Tables (The data)
- Figure legends (Provide essential details on the data)
- Figures (The data)

The methods section should answer the following question:

HOW?

The “methods” section may also be referred to as ;
procedure, experiments, experimental, simulation, methodology, or model

This section should contain sufficient detail for the reader to replicate the work done and obtain similar results.

Here are some tips about grammar elements needed for your methods section;

passive / past simple passive or simple present;

The samples were collected.
A net is wrapped around the outer metal ring.

articles "*The*" and "*a*"

The softest layer of membrane was removed.

The data analysed in this paper came from a large number of sampling events when both a scrape and a trap sample were collected from the drill hole at the same time. Given that the trap was set immediately after scraping, it was regarded as a contemporaneous sample, even though it was retrieved eight weeks later. Sampling occurred in 65 different areas within the Pilbara (90% of effort) and the eastern Yilgarn regions of Western Australia (Fig. 3), with most drill holes being sampled twice in different seasons. The areas varied in size from about 2–400 km2 but were mostly <10 km2. When two traps were set in one drill hole, trapping results were combined prior to making a comparison with the equivalent scrape sample.

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We present R-band images covering more than 11 square degrees of sky obtained with the KPNO 4-m telescope in preparation for the Spitzer Space Telescope First Look Survey. The FLS was designed to characterize the mid-infrared sky at depths 2 orders of magnitude deeper than previous surveys. The extragalactic component is the first cosmological survey done with Spitzer. Two relatively large regions of the sky were observed: the main FLS extra galactic field (17h18m+59d30m) and ELAIS-N1 field (16h10m+54d30m). The overall quality of the images is high. The relative astrometric accuracy is better than 0.1" and the typical seeing is 1.1". Images are relatively deep since they reach a median 5-sigma depth limiting magnitude of R=25.5 (Vega). Catalogs were extracted using SExtractor using thresholds in area and flux for which the number of false detections is below 1% at R=25. Only sources with S/N greater than 3 were retained in the final catalogs. Comparing the galaxy number counts from our images with those of deeper R-band surveys, we estimate that our observations are 50% complete at R=24.5. These limits in depth are sufficient to identify a substantial fraction of the infrared sources which will be detected by Spitzer.

Fadda,Jannuzi, Buell, Ford, Alyson, Storrie-Lombardi, Lisa,- 2004/03/19, The Spitzer Space Telescope First-Look Survey: KPNO Mosaic-1 R-band images and source catalogs. Vol. 128- 10.1086/421366, The Astronomical Journal ©

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What did you actually do?

WHAT DID YOU FIND OUT?

The parts of your results section =

First paragraph : Write down the aim and results of the first experiment; Why was it done?
Second and third paragraphs : Describe subsequent experiments carried out based on the results of the first experiment. Strengthen your observations and refer to figures.
Fourth paragraph : Provide a summary of your observations and write one clear statement about your results.

The tense used for the “results” section is, generally,

past simple

These are verbs such as; *were, incubated, inactivated, failed, was, wanted, tested..*

Sometimes the **present tense** is used to make claims, state facts, or refer to a figure;

- The figure *shows* the outcome of the first experiment.
- The legends *provide* relevant details on how the experiments were performed.

Here are some useful phrases for describing your experiment;

We wanted to…

To determine whether...

The purpose of our experiment was...

Here are some useful phrases for describing figures and graphs;

Box 4.7 describes figures 1 and 2…

Table 1.3 provides data about carbon gases...

This visual illustrates trends...

Box 4.3 Sections of a scientific manuscript and the information they contain

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Understanding how visuals are effectively used in scientific texts and lectures

Academics frequently use visual aids such as charts, diagrams, graphs, maps and tables to visually communicate a message

What kinds of visuals are used most frequently in your field?

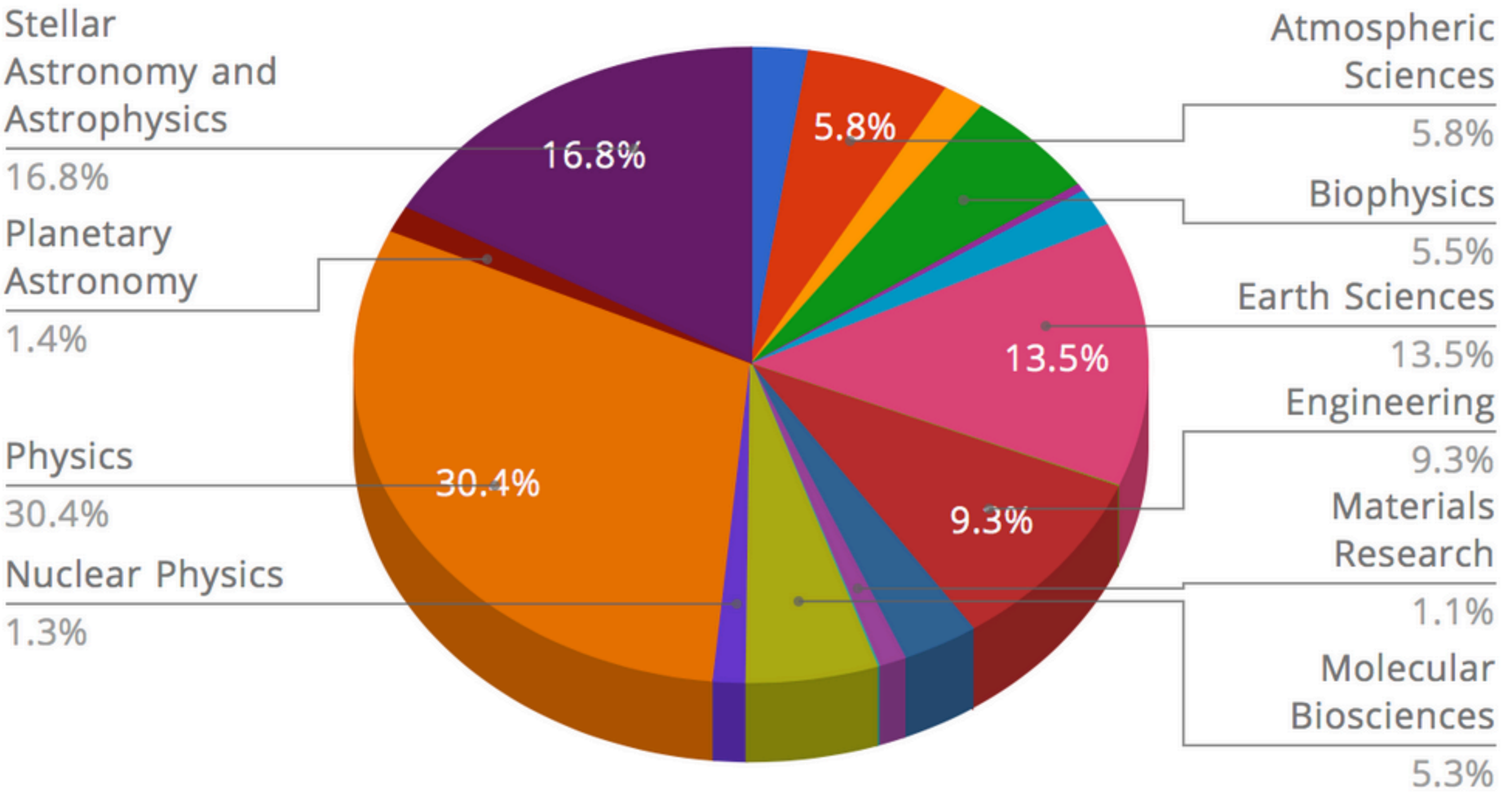
Lecturers often use visual representations of complex information to inform, illustrate, express, and summarize

Visuals include the presentation, illustration, or comparison of;

data relationships proportions

trends processes percentages

Can you describe what is shown ?



https://www.hpcwire.com/2017/05/02/current_running_jobsinscience

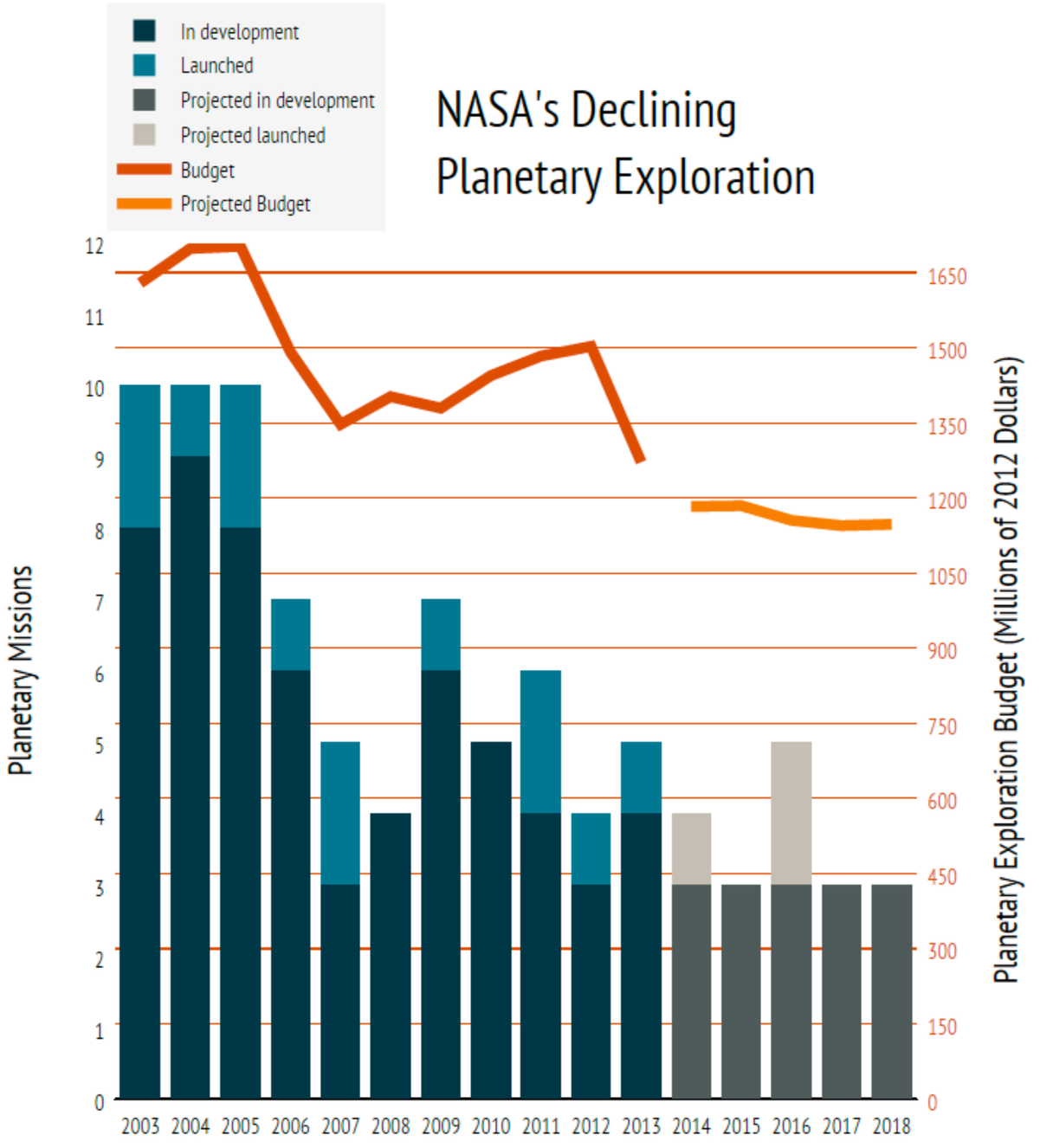


Chart Link: https://plot.ly/~bchartoff/919/planetary-missions-vs-fiscal-year/

Describing what was shown in the previous visuals;

Vary your language

You should not keep repeating the same structures. The key language when you write about pie charts is **proportions** and **percentages**.

Common phrases to see are **"the proportion of…"** or "**the percentage of…"**

*However, you can also use **other words** and **fractions**, such as two/fifths, 18 percent, over half..*

The bar chart shows… ***numbers of / levels of / amounts of***

Describing visuals: Data Commentary

When describing visuals, use passive or active verbs in the present tense:

*observed totals or levels.. are shown / the **visual** shows*
shows an increase or decrease in.. / increased or decreased levels of..
suggested by or indicated by / The data suggests or indicates

When describing current data use present perfect tense: has grown, has declined, has risen, have grown, have increased

When talking about past data use the past simple tense: grew, declined, rose, remained steady, dropped, leveled off

vocabulary

downward trend	*rise*	*fall off*
steep fall	*low point*	*decline*
remained steady	*level off*	*spike*
peak / peaked at	*fluctuate*	*sharp*

The language of change

(past tenses in brackets)

Verb ↗	Adverb	Verb ↘	Adjective + noun
grow (grew)	slightly	drop (dropped)	a slight drop
rise (rose)	gradually	fall (fell)	a gradual fall
increase (increased)	steadily	decrease (decreased)	a sharp decrease
climb (climbed)	sharply	decline (declined)	a steady decline
also: a peak, to peak, a plateau, to level off, a trough			

Bailey, Stephen, 2015. Academic Writing: A Handbook for International Students, Routledge, Oxon.

Giving general panorama of past-to-present literature

There is a considerable / vast *amount of literature on …*

In the literature there are many / several / a surprising number of / few *examples of …*

What we know / is known *about X is largely based on …*

Much / Not much / Very little *is known about …*

Many / Few *studies have been published on …* [Ref]

Various approaches have been proposed / put forward / suggested / hypothesized *to solve this issue [Ref].*

X has been identified / indicated *as being …* [Ref]

X has been shown / demonstrated / proved / found *to be … [Ref]*

X has been widely investigated / studied / addressed *… [Ref]*

Xs have been receiving / gaining *much attention due to …*

In the traditional / classical *approach, X is used to …*

In recent years there has been considerable / growing *interest in … [Ref]*

A growing body of literature has examined / investigated / studied / analyzed / evaluated *… [Ref]*

Much work on the potential of X has been carried out [Ref], yet / however *there are still some*

"That isn't dark matter, sir—you just forgot to take off the lens cap."