



Australian
National
University

Science report writing

ANU Academic Skills

What's the purpose of a report?

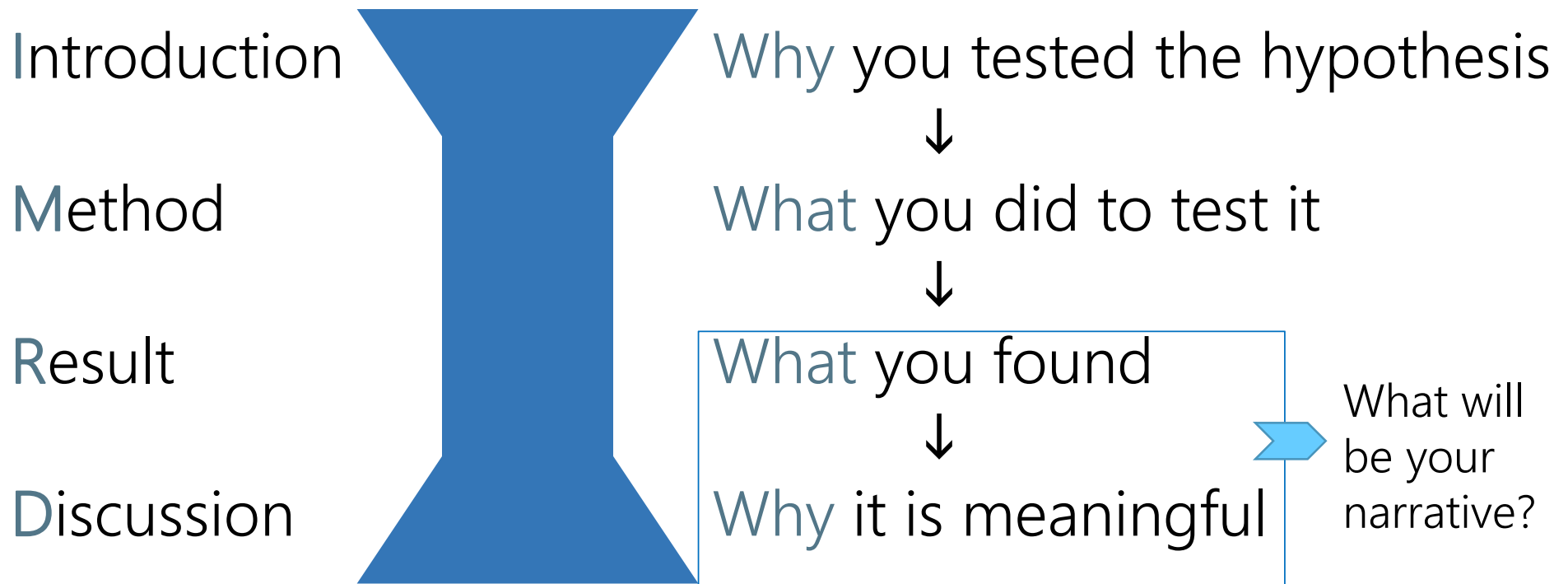


To explain **why**
you are testing a
hypothesis, and
why your findings
are meaningful...

⇒ Write to persuade



Every part of the report should contribute to the purpose...



Where would you start?

- With the hypothesis?
- With the results?

What have you been instructed to do?
What makes sense to you?



Possible sections

Title

Abstract

Introduction

Methods

Results

Discussion

References

Appendices

Check with your course requirements

Introductions

Purpose: show that you understand why you carried out the study/tested the hypothesis

Common parts:

- Background or context
- Define the problem or issue to be addressed
 - What we know and what we don't
- Aims and hypothesis/hypotheses
- Rationale for methods

Biology

'This study aims to identify the bacteriophage which can treat antibiotic resistant MRSA by using DNA fingerprinting to compare the profiles of bacteriophages; Φ TCH60, SAP-26 and Φ SH19 to the unknown sample.'

Psychology

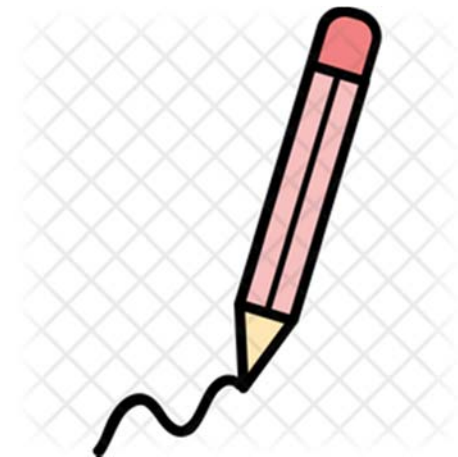
'Firstly, it is hypothesised that adults who had childhood ICs would have a higher orientation to fantasy than adults who did not have one. Secondly that adults who had a childhood IC will engage in more self-talk than adults who did not have one.'

Introductions

Do you know **why** they tested their hypothesis?

Can you find the parts?

- Background or context
- What is the problem
 - What we know and what we don't
- Hypothesis or aim



Methods

Purpose: how you tested your hypothesis

What you did – often descriptive

- '5µl of gel loading dye was placed in each sample tube, each tube was then vortexed and placed in the microcentrifuge.'

Enough detail for the work to be reproducible and falsifiable

Psychology

Method

Design

This experiment was a survey experiment with a between-subject design. The independent variable was...The dependent variable was...

Participants

Participants were 382 (262 female, 177 male and 3 other gender) Australian National University (ANU) students completing a first-year undergraduate psychology degree. The age ranged from...Participants were recruited...

Procedure

During laboratory class participants completed three questionnaires online...

Results: what did you find?

- **Purpose:** describes data and outcomes of experiments
- Aligned with hypothesis/aim
- Still quite descriptive
- Your key findings/results are highlighted
 - less important things might be in appendix

Tips on writing your Results: generating ideas

- **Present evidence to support or reject your hypothesis**
 - Do you think your hypothesis will be supported or rejected by your results? Why?
- **Decide your most important findings**
 - What do you think your most important findings will be?
- **Decide what to include and what to leave out of your story**
 - What will you include and exclude to tell the story of your results?
 - Comment on (but don't discuss) the results.

Results: generating structure

- Present the finding in a logical order
 - What kind of order will you use for your Results?
- Make it easy for your reader to interpret your findings

Tips on figures and tables

- Make most important points prominent
- Tables and figures should 'stand alone'
- Think about the point you want to make, and then produce a graphical representation.
- Perhaps draw it out first, so that you are clear on what you want to say, before using software to produce your figure

Tips on figures and tables

- ✓ Use tools available (shape, shading, pattern or weight of symbols, markers or lines) to emphasise the main results
- ✓ Don't clutter your figure with unnecessary lines, legend symbols, or numbers
- ✓ Label axes descriptively and clearly (no jargon)
- ✓ Story telling titles for figures (highlight key point) Not 'The effect of X and Y' but, 'X increases as Y decreases'
- ✓ Be consistent in style
- ✓ Sort data to show the most important relationship between elements

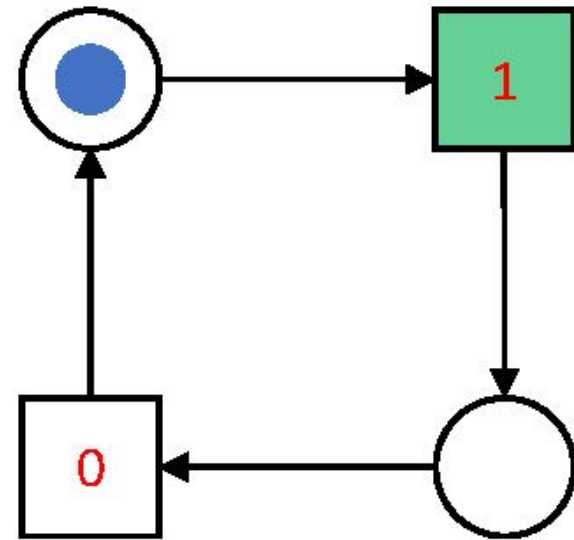


Figure labels

- Figure labels should succinctly capture the meaning of the figures.
- Always explain what your figures mean. E.g. 'Fig. 1.2. This scatterplot shows...'

Results

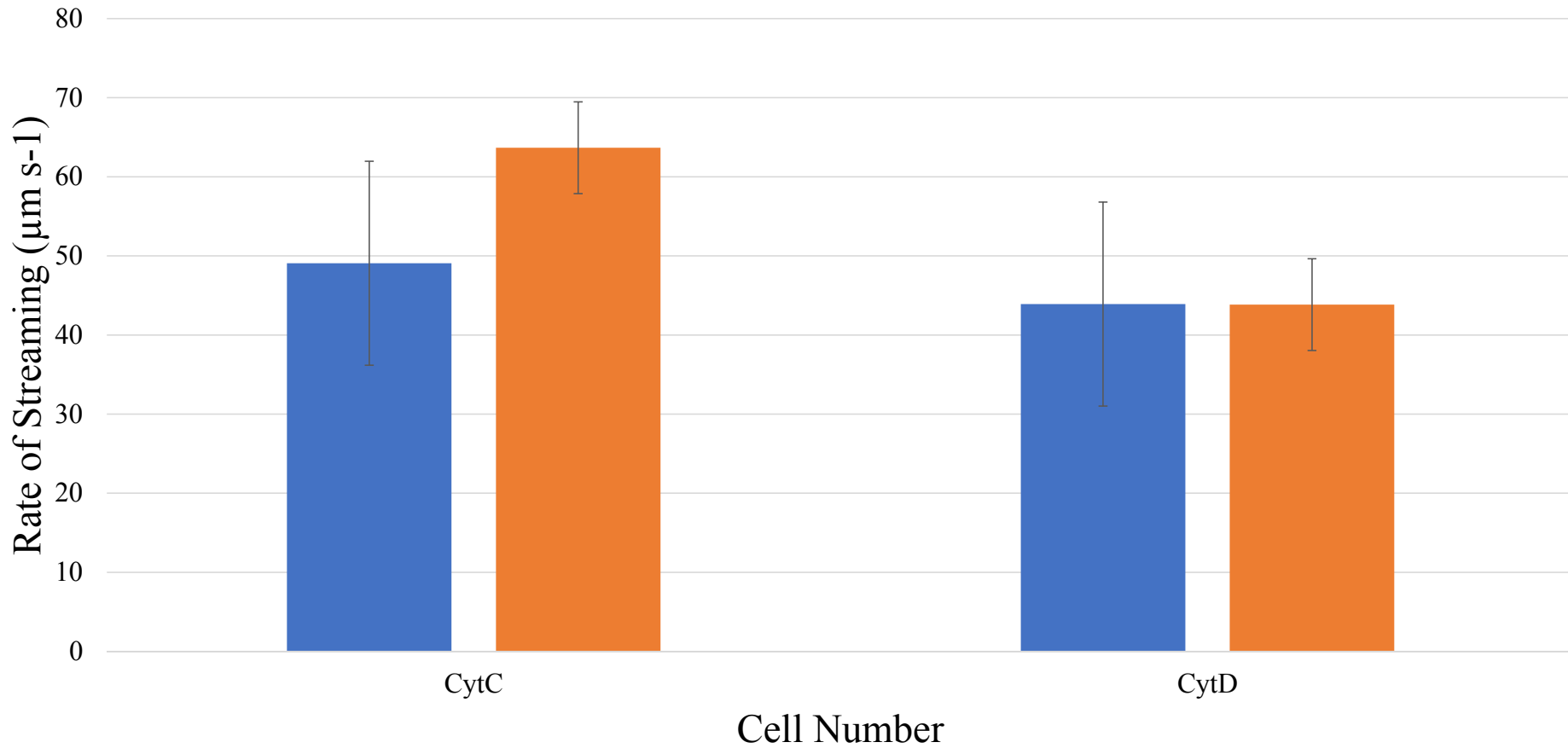


Figure 1. The graph compares the initial rate of streaming of the *Nitella pseudoflabellata* cell with the rate of streaming after the addition of cytC or cytD. Before addition of cytochalasin is displayed in blue while after is displayed in orange.

Table 1. The mean rate of streaming before and after addition of cytC in $\mu\text{m s}^{-1}$ for the *Nitella psedoflabellata* cells along with the standard deviation and p value. The results were obtained from Dona Anthony and Ruby Soin.

	Mean ($\mu\text{m s}^{-1}$)	Standard deviation ($\mu\text{m s}^{-1}$)	P value ($\mu\text{m s}^{-1}$)
Before cytochalasin	49.07	25.21	0.01
After cytochalasin	63.67	12.89	

Discussions

Purpose: explain what the results mean and why they are important

- What are your main points?
- Argue whether the results support or do not support the hypotheses
- Explain any results or observations that were unexpected
- How do the results relate to the field?
 - clearly link to the introduction
- Persuade your reader of your study's validity despite limitations
- Sometimes you can point to possible improvements (e.g. methodological changes to reduce error)

It is still possible to get a good mark for an experiment which did not "work" as expected so long as you provide convincing explanations and demonstrate knowledge and understanding of the theory.

Writing your discussion section

- Start by reminding readers of your study's main purpose/aim
 - 'This experiment aimed to identify the unknown...'
- Summarise and review most important findings
 - ✓ Whether original hypothesis was supported
 - ✓ How the findings answer the research question / meet objectives / aims
 - ✓ Whether they agree with findings of other researchers

...The unknown bacteriophage was identified through...This was because the results indicated that the DNA profile of SAP-26 and the unknown sample had similar patterned and shaping fragments.

SAP-26 has previously been shown to successfully treat MRSA. Such research was conducted by...Therefore, the results obtained from this experiment is concurrent with previous research.

'The findings support the notion that just a single night of restricted sleep is enough to cause a considerable decline in alertness. They also support recently published findings suggesting that habitual activity may not predict cognitive performance in relation to sleep (ref).'

Writing your discussion

Findings

- Explain your findings using the literature. Speculation about the findings also need to be supported by references
- 'Results from other experiments...indicate that...'

limitations

- Discuss limitations that restrict the findings' generalisability
- 'The extraction method and bacteria used may have meant antibacterial effect was not able to be displayed.'

Implications

- Discuss implications of the study
- 'Perhaps using a more common bacterium involved in infections traditionally treated by *Rubus idaeus* would show a more effective antibacterial activity.'

Future research

- Make recommendations for future research
- 'Further research should be conducted...'



Tip: organise your writing around your
topic sentences – they are your outline



Topic sentence states the ***point*** - the idea and the argument

Supporting sentences provide evidence and analysis to support the point

Concluding sentence summarises the idea and/or links to the next

The extraction method and bacteria used may have meant antibacterial effect was not able to be displayed. Reviews of extraction methods of plants indicate that the most accurate method of extraction is refluxing (ref). This method has been used in past research analysing *Rubus idaeus* where an antibacterial effect for the plant was observed (ref). Therefore, the shaking method used in this experiment may have created a less concentrated extract thus accounting for the results. Also, the bacteria used, *Micrococcus luteus* has not been used in experiments involving *Rubus idaeus* and antibacterial activity. Perhaps using a more common bacterium involved in infections traditionally treated by *Rubus idaeus* would show a more effective antibacterial activity.

Topic sentence states the ***point*** - the idea and the argument

Supporting sentences provide evidence and analysis to support the point

Concluding sentence summarises the idea and/or links to the next

Use past tense

- when the sentence focuses on the completed study: what you did and what you found.
 - 'The analysis **did not** prove the hypothesis.'

Use present tense

- to describe an always true situation.
 - "Inexperienced programmers **need** to use simple language when ..."
- when the sentence focuses on the document, which will always be there.
 - 'This graph **shows** ...'

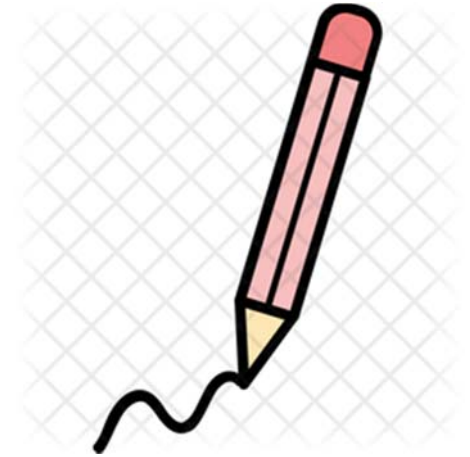
Use modal verbs (like may and could)

- to comment on results.
 - 'This result **may** be related to ...'

Discussions

Compare the two examples

- What are the differences between them?
- What makes the second example stronger than the first?



Conclusions

- Only found in some reports
- A *very* brief summary of your main results.
- For a typical first year experiment this can be a single line and will very rarely need to be more than a few lines long (one paragraph).

Introduction vs. abstract

Introduction

- Explains the context: problem, reasons for doing the experiment
- Reviews the literature to explain your hypothesis and how to test it

Abstract

- Context/background
- Problem and hypothesis
- What you did
- Your key findings
- Significance of findings

What does an abstract do?

For many years, a debate has existed concerning the importance of syntax and semantics in the understanding of language. To add data to this topic this experiment has been designed to answer the question: does the semantic and syntactic correctness of a sentence make it easier for a person to remember the sentence? The experiment involved 280 introductory psychology students who were split into pairs. One member of the team acted as the experimenter while the other acted as the participant. The experimenter read a sentence to the participant who would read the sentence back. Three types of sentences were involved: 1) normal sentences with correct semantics and syntax; 2) sentences with invalid semantics but valid syntax; and 3) sentences with both invalid semantics and syntax. The accuracy of the recall sentence was measured with the results clearly showing that properly structured sentences were far easier to recall than the other types of sentences.

Context

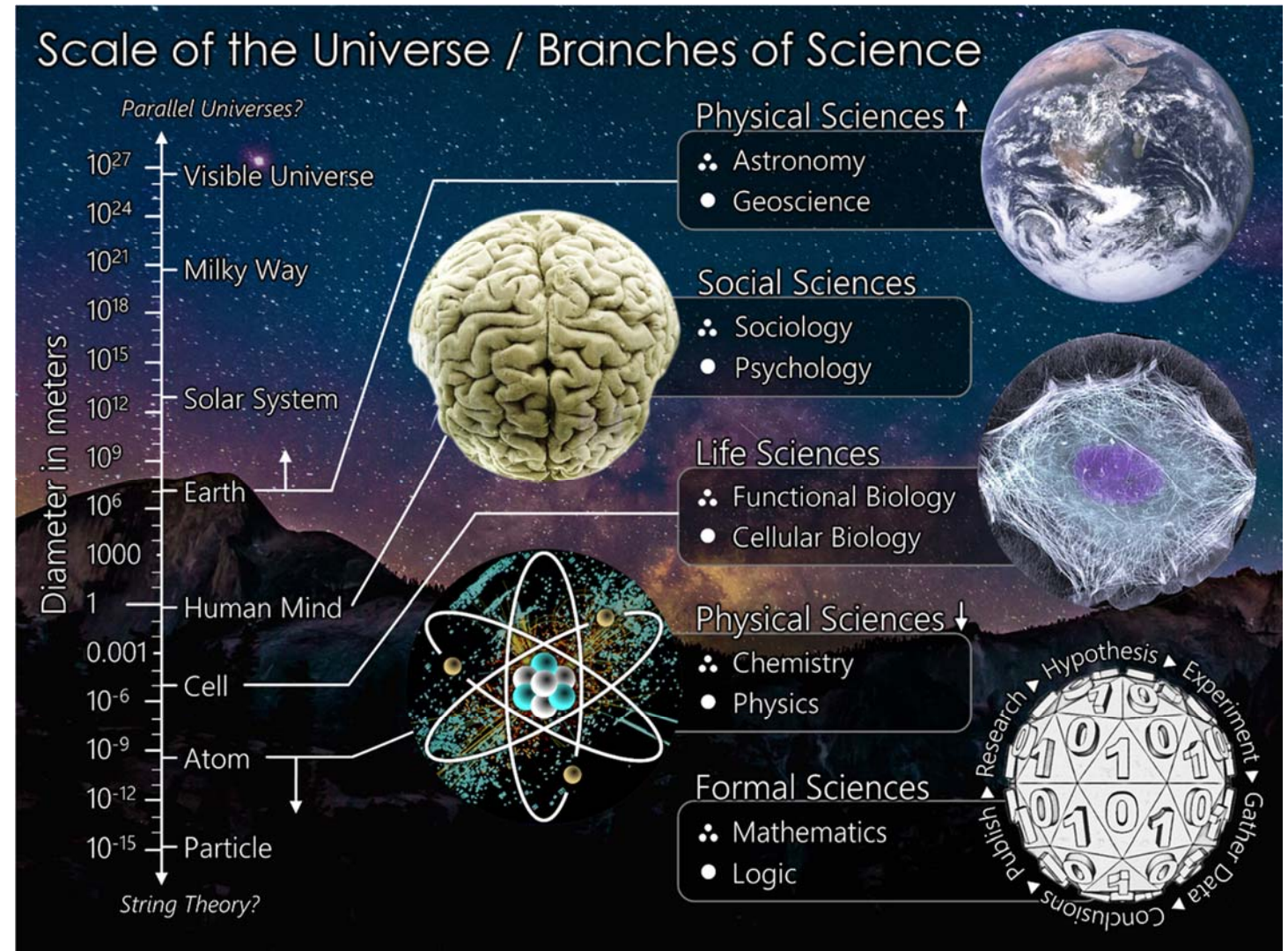
Aims and Hypothesis

Methods

Results (note that this abstract does not state the significance of the findings)

Questions?

It's very hard to
be a scientist
without them!



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