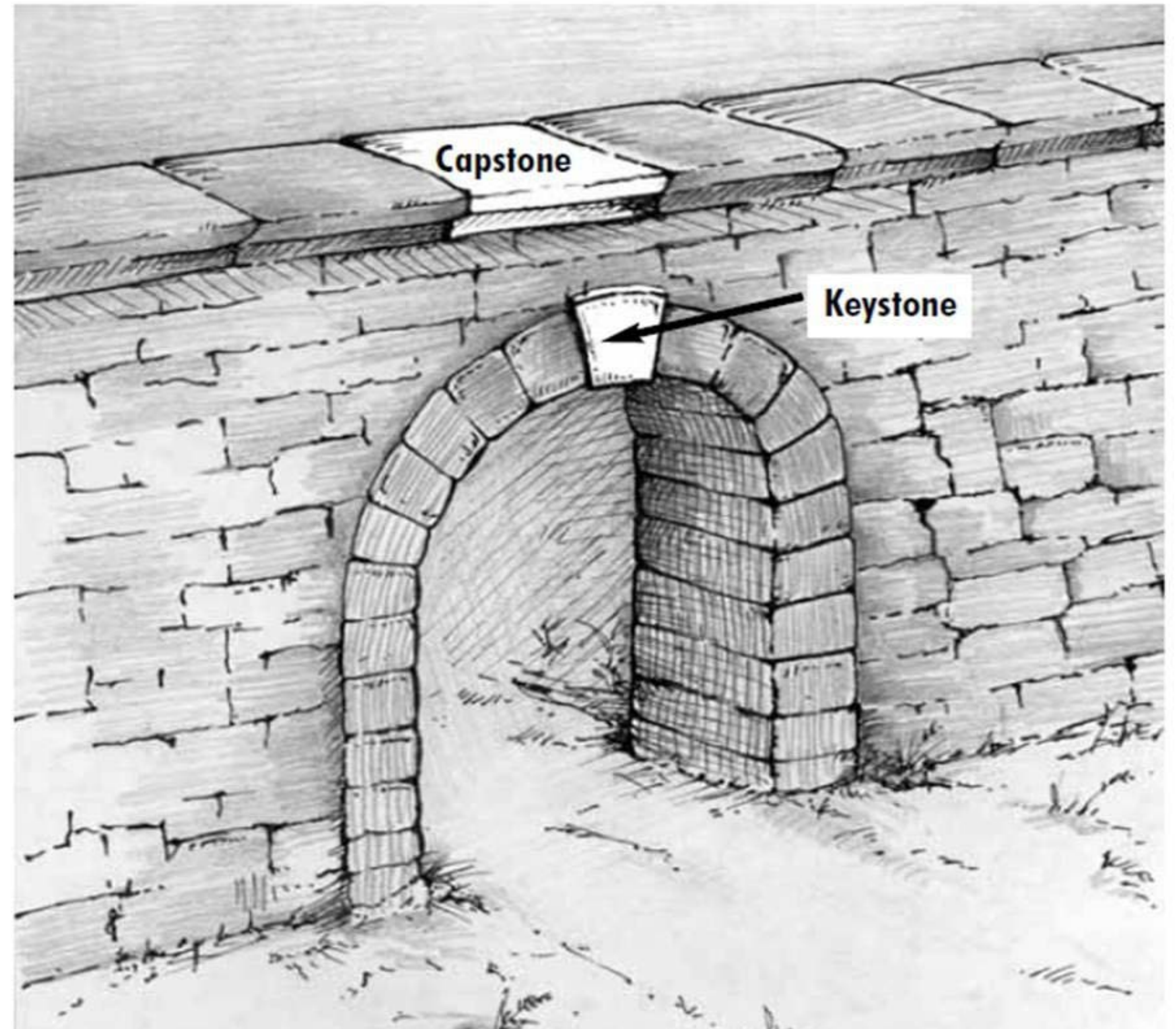


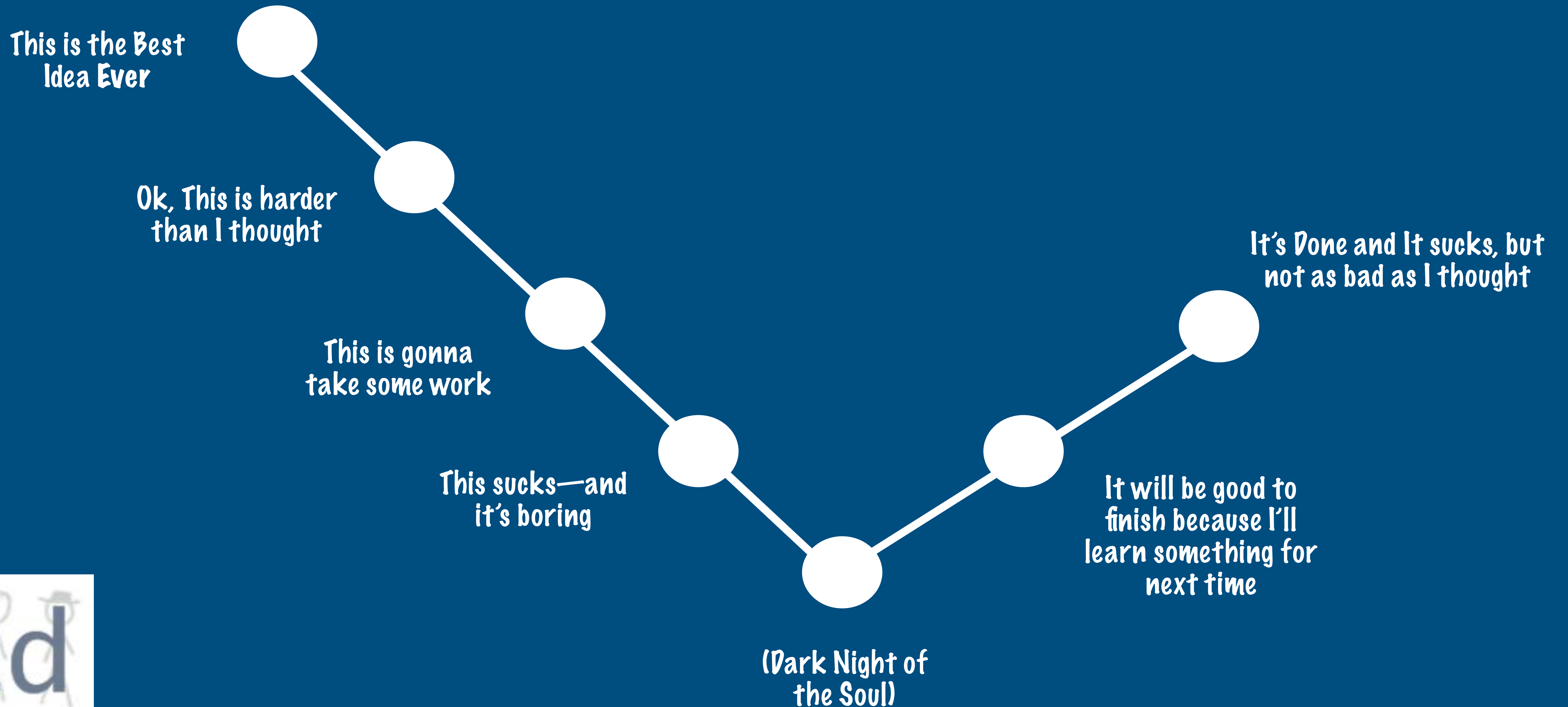
# The Capstone Project 2022

An Overview of what to expect in the Spring Semester

Ernesto Salcedo, PhD



# The Life of a Capstone Project



# Talk Overview

- Important Dates
- Organization of Workshop
- Written Report
- Presentation
  - Poster
  - Talk



# Postponing your Presentation

## Capstone Overview

- Not everyone presents on the Capstone Presentation Day
  - Timing — results aren't ready
  - Delay in getting started
  - Issues with other courses (Embryo)
- You may delay the presentation (and the deadlines associated with the written report)
  - You may even be able to still graduate with your classmates
  - Better strategy is to delay the capstone than to fail a core course, which is only offered once a year
- If you want to delay, let me know and discuss with your committee

# Grading the Capstone

## Capstone Overview

- Review the Rubrics and the Excel Grading Form
- Grades from:
  - Your Committee
  - Your Mentor
  - Your Advisor
  - Me

# Workshop Organization

## Capstone Project

- Discuss how to write the written report
  - Assignments on the Results and discussion
  - Get feedback from your committee / advisor
- Discuss how to create a Poster and a Talk
  - Small group sessions to work on our Posters and Talks
    - Sign up for a time-slot between 10 and 1 pm via canvas
    - Bring your poster / talk and be prepared to present
    - iteratively (we'll start with the background first)

# Written Report

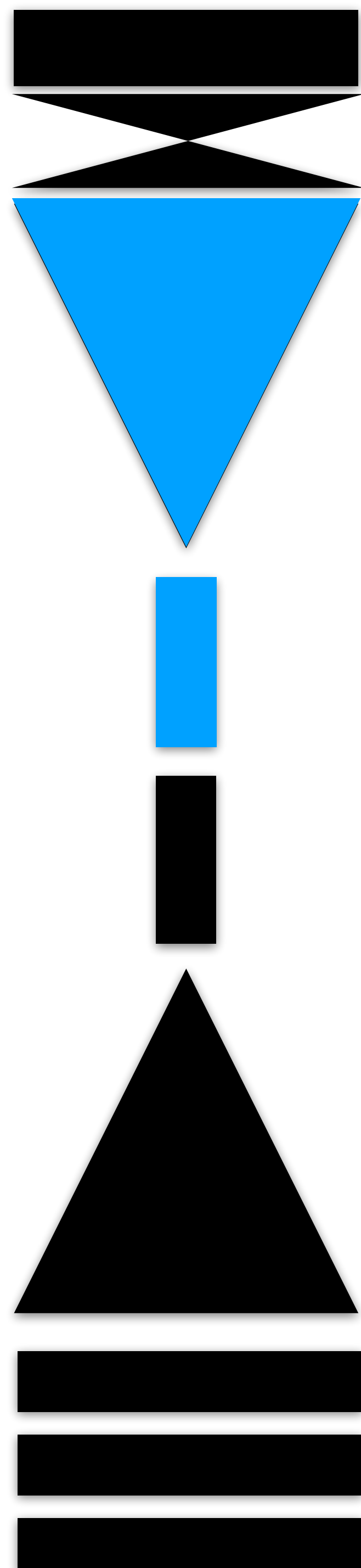
# Written Report

## Overview

- You have less than a month to finish up your written report
  - First Draft **Due February 28th**
- The goal of this draft is to provide a document to your committee for discussion
  - You should mostly be done by this time
  - Just waiting on some data or data analysis
    - just leave space for the missing result in question (and maybe a description of what that result will look like)
- Everyone should be on board with what needs to be finished by April
  - No surprises!



# The Structure of the Written Report



Title Page

Objective / abstract

Background / Rationale

Methods / Project APPROACH

Results

Discussion / Future Directions

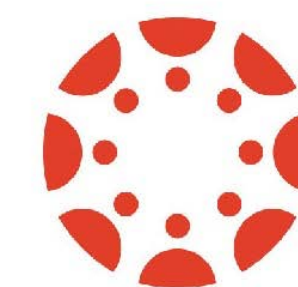
Personal Reflection

Literature Cited

Appendix

A And  
B But  
T Therefore

} Randy Olson  
Ted Talk



canvas

Author's Guidelines

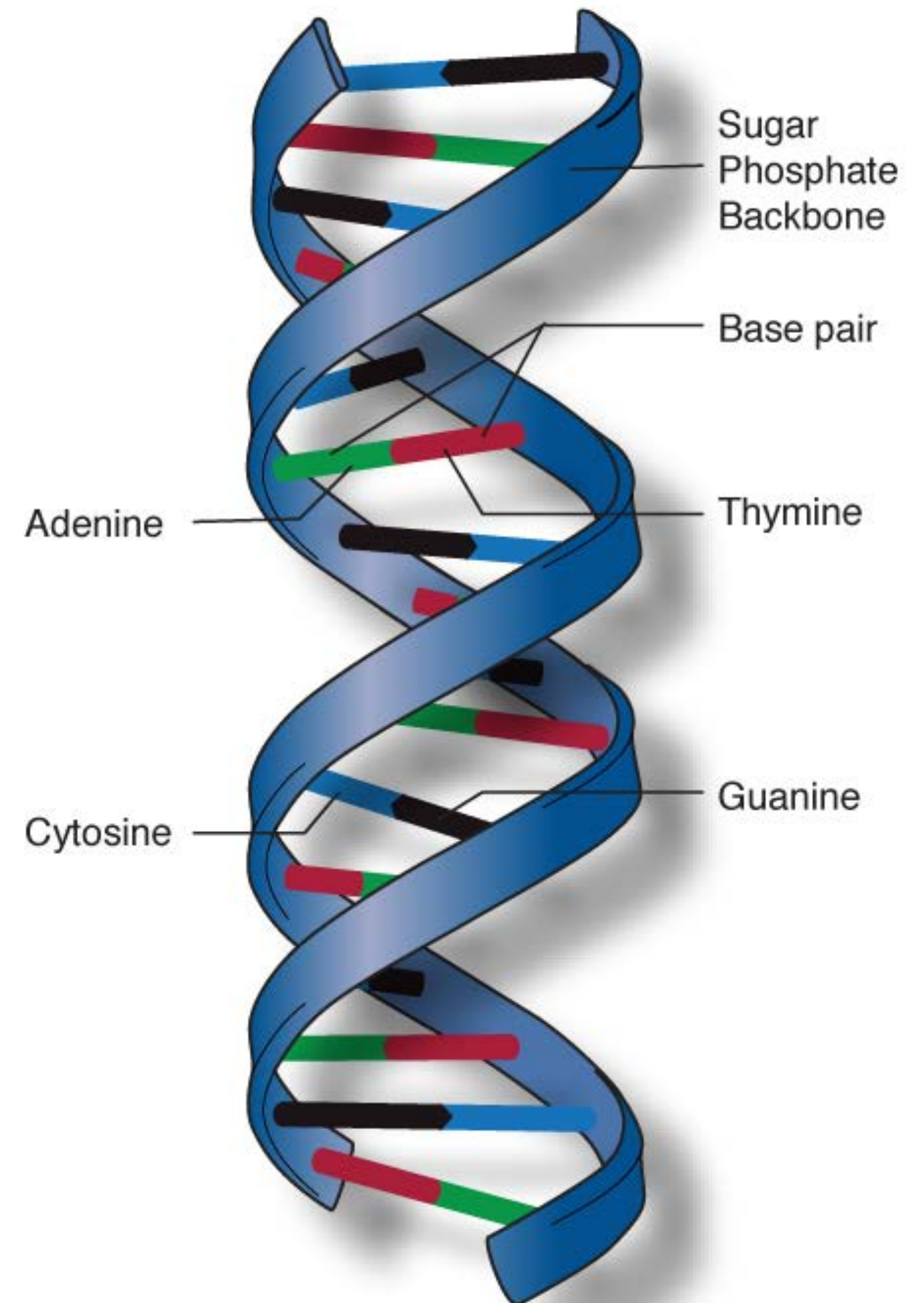
Anatomical Sciences  
Education



# EXAMPLE: Discovering the structure of DNA

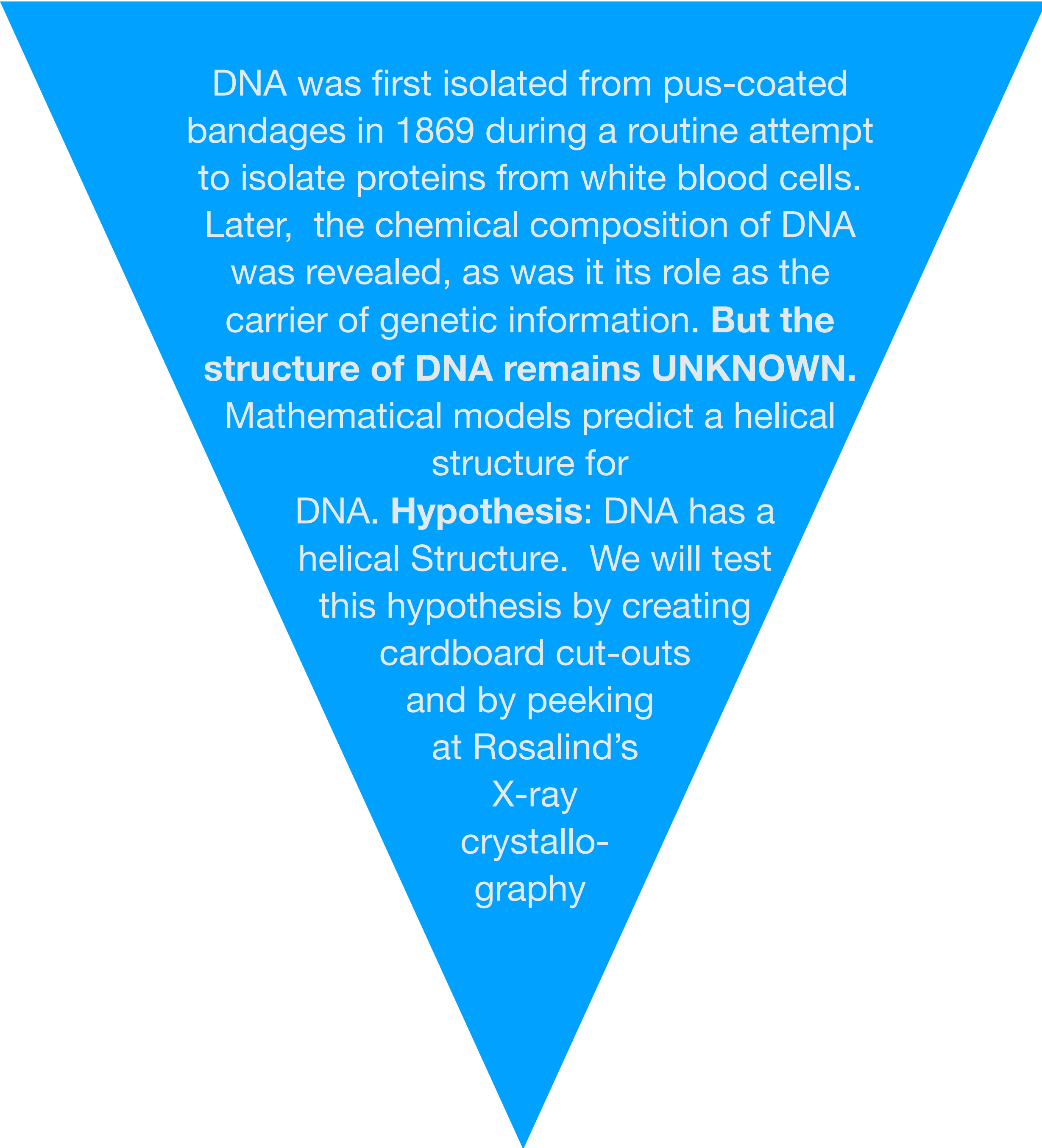
## Background and Rationale

- **Objective:** Determine the Structure of DNA
- **Background:** DNA chemical composition known, role as carrier of genetic info known. Some evidence suggests a helical structure
- **Rationale:** BUT how the DNA stored info remains UNKNOWN.
- **Hypothesis:** DNA has a helical Structure
- **Prediction:** If DNA has a helical structure, its X-ray diffraction pattern would be X-shaped
- **Methods:** X-ray crystallography / Root through Franklin's lab for X-ray diffraction results
- **Analysis:** It's a Helix! Collect nobel prize.



# Background and Rationale structure of the written report

- Starts Broad and focuses down
- Should discuss what has been previously accomplished
- Should tell a compelling story and discuss a question that needs answering (And, But, Therefore)
- Every sentence should be relevant to your rationale (Avoid Fact Dumps)
- Should build an argument so that your hypothesis is the obvious next question to ask
- Finish with the statement of the hypothesis and a one sentence overview of the methods



DNA was first isolated from pus-coated bandages in 1869 during a routine attempt to isolate proteins from white blood cells. Later, the chemical composition of DNA was revealed, as was its role as the carrier of genetic information. **But the structure of DNA remains UNKNOWN.** Mathematical models predict a helical structure for DNA. **Hypothesis:** DNA has a helical Structure. We will test this hypothesis by creating cardboard cut-outs and by peeking at Rosalind's X-ray crystallography



# Methods

## structure of the written report

- Procedural OVERVIEW
  - NOT a step-by-step protocol
  - Sample Descriptions - Number of Study Participants, male vs female, etc.
  - Sources - where you obtained materials
  - Statistical analysis - software, types of analysis used: Power Test, t-test, ANOVA, etc.
- Break the Methods down into subsections
  - 1-2 paragraphs prepended with subsection headings
- For example:
  - **Immunohistochemistry**
  - **Imaging**
  - **Modeling**
  - **Data and Statistical Analysis**
- Each paragraph or section should describe a distinct method.



Crystallized DNA  
X-ray diffraction

Number of  
Samples

Software  
used for  
stats

Machine  
used

Source of  
Samples

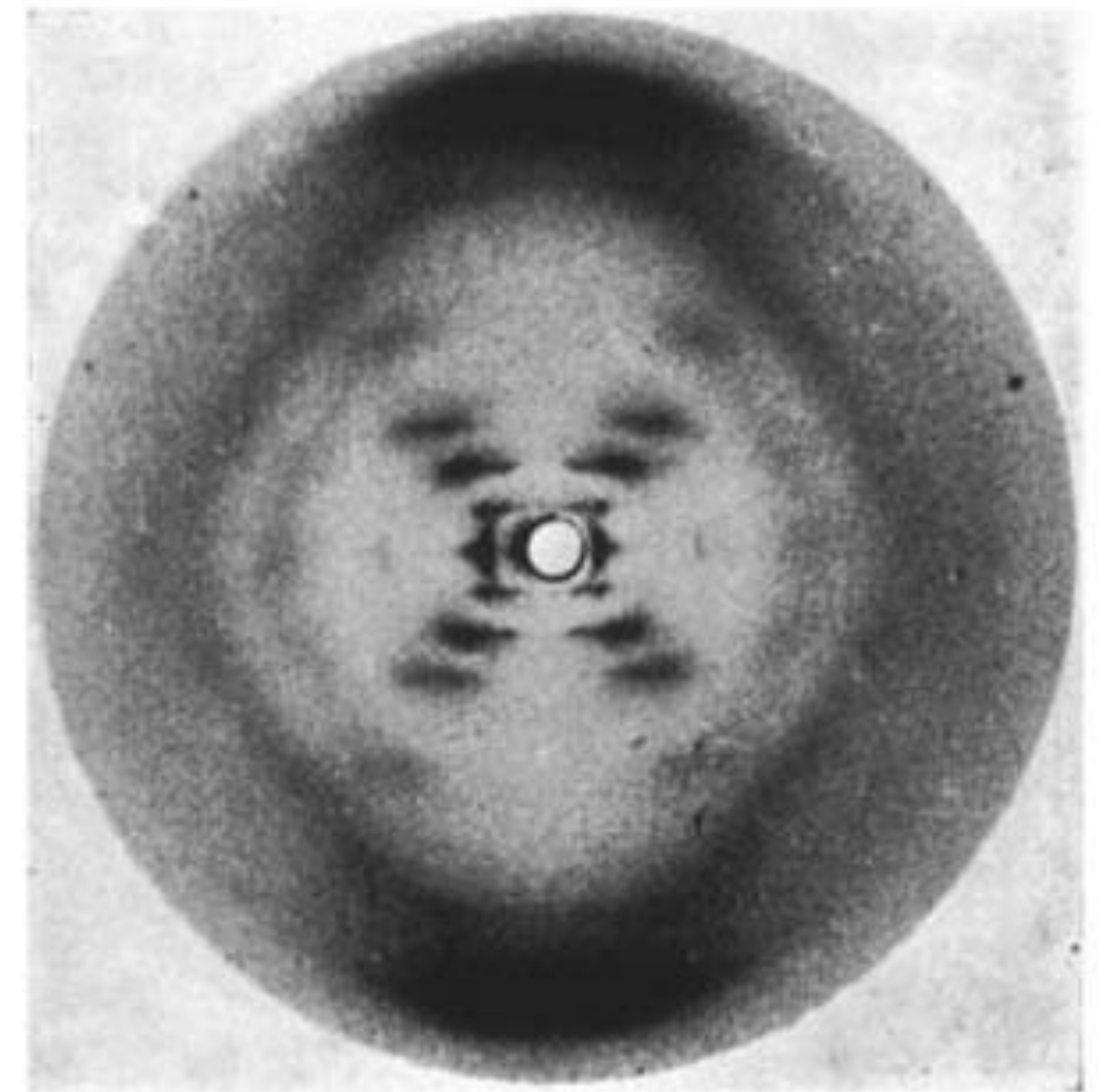
Procedural Overviews | Sample and Source |  
Statistical Analysis | Software | Figures



# Results

## structure of the written report

- Where you Clearly present your results
- Break your results down into separate sections
- Only **your** data should be included in the results.
  - previous results would appear in the background and rationale
  - Discussion of results should be in the discussion
- Make sure your results address the hypothesis or objective of your Capstone Project.
  - You can discuss the rationale when you present your results: “Because we thought THIS, we did THIS, and we got THIS result”
- Remember: your results MUST include an Imaging and/or a Modeling Component
- Be sure to include figures and figure legends that clarify and highlight your results.



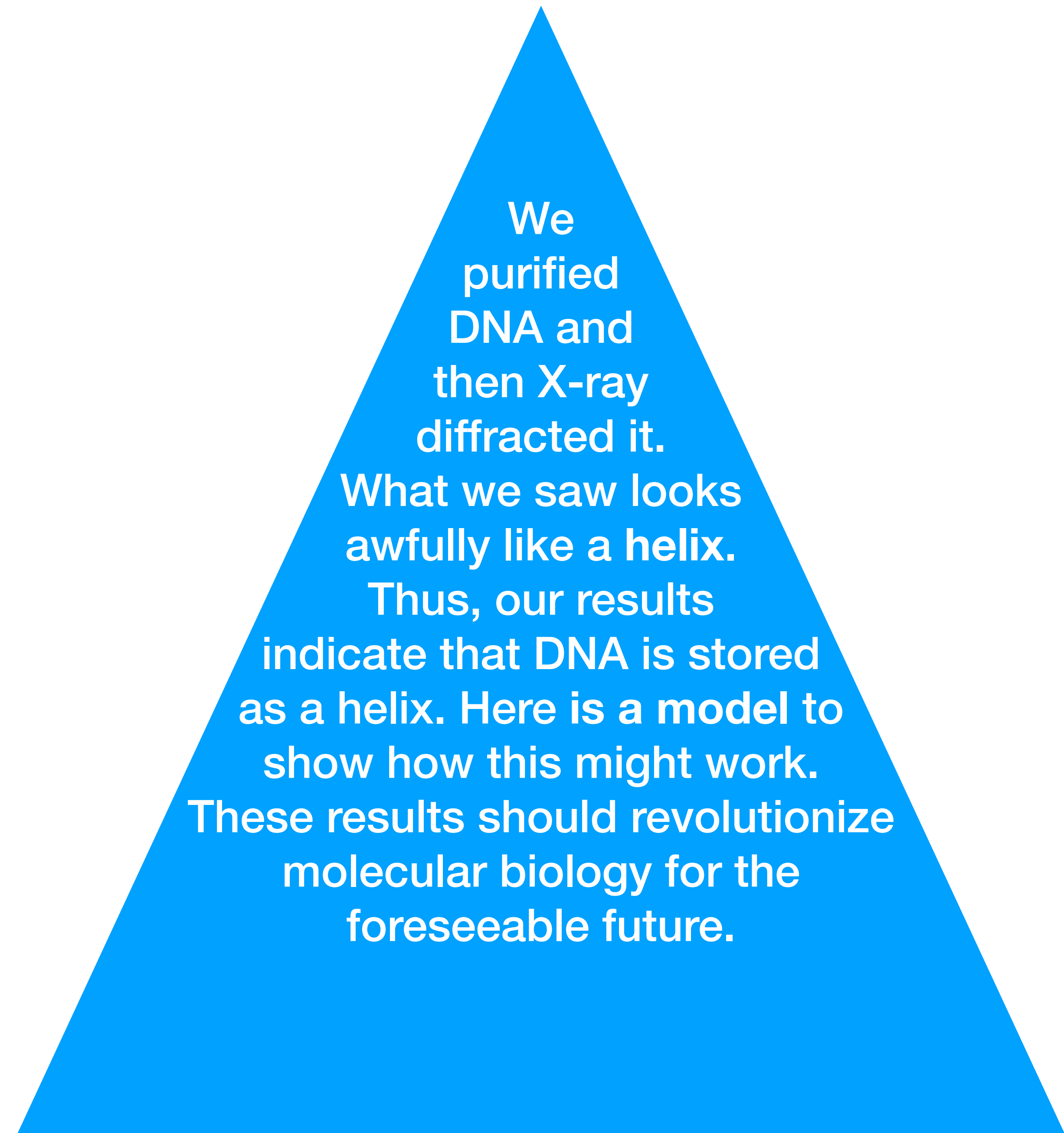
**Figure 1.** X-ray diffraction of crystallized pure DNA (from Rosalind's lab)



# Discussion

## structure of the written report

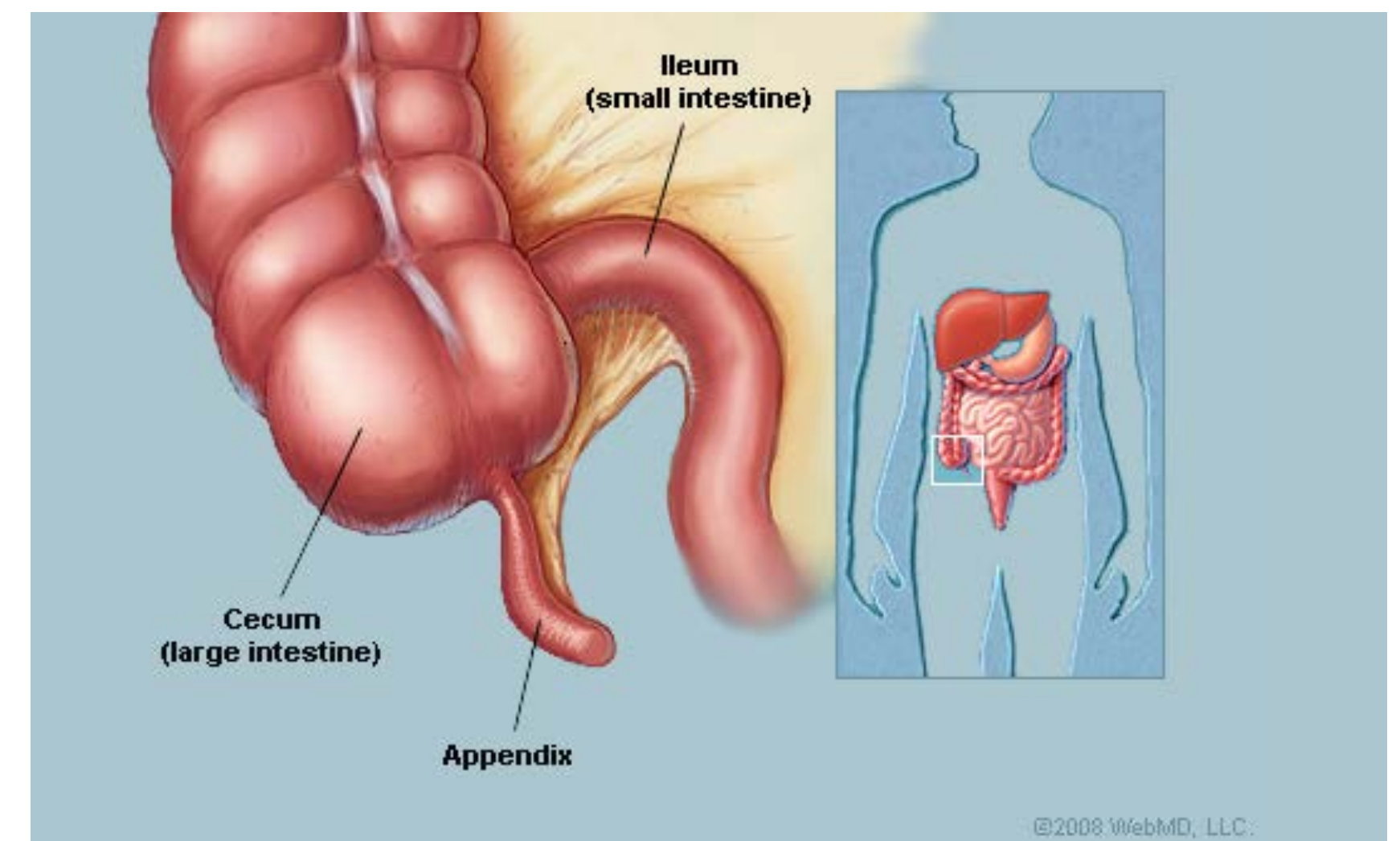
- Where you Discuss what your results mean
- Parts
  - **Summary** - the first paragraph summarizes the results (one paragraph)
  - **Discussion of Hypothesis** - how your results did or did not answer prove your rationale rationale
  - **Future Directions** - any additional steps that you would need to complete your project for publication
  - **Broader implications** - what do your results mean in the broader scheme of things



# Other Sections

## structure of the written report

- **Personal Reflection:**
  - brief (1 Paragraph) description of your personal interest in this project
  - i.e. what did you personally achieve with this project for your personal goals
- **Literature Cited:** Use the ASE site for guidelines
- **Appendix:** Optional - doesn't count towards page limits. Can contain most anything you want (that's related to the project)
  - Detailed protocols.
  - Surveys.
  - Software Programs.





# Abstract and Objective

## structure of the written report

- A brief, one paragraph summary of your Report
- Includes concise statements on all parts of the project:
  - Your Objective, Project Background
  - Methodology, Results,
  - Broader Impacts
- Should be a compelling narrative
  - And, But, and Therefore
  - Avoid Jargon

The overall objective of this project was to identify the structure of DNA. We know that DNA stores genetic material. And we know what nucleotides make up DNA and their respective ratios. But, we don't know the 3D structure of DNA. We hypothesized that DNA has a helical structure. Therefore, we (Rosalind) crystallized pure DNA and performed X-ray diffraction. Our results indicate that DNA has a helical shape that allows it to store genetic information.

Pro-tip: Write the abstract **last**