

Manifold Lab Part B: Pocket Analysis Grant Proposal

I. INTRODUCTION

Today, your research team will review two other teams' *Pocket Exploration Grant Reports*. You will then select one, design an experiment to test their model, and write a grant proposal to acquire the funding to carry out that experiment with new and improved equipment.

Section II contains instructions for writing the proposal. Section III lists the additional equipment you may request in your proposal's budget.

Before proceeding to the next section, complete peer review according to your TA's instructions.

II. POCKET ANALYSIS GRANT PROPOSAL

A. Select a Model

To support equal access to *Manifold Pockets* and reproducibility of results, your proposed *Pocket Analysis Grant* project must focus on another *Pocket* previously investigated by another research group's *Pocket Exploration Grant* project, building upon the hypotheses described in their report.

There will be printed copies of each group's report in the lab room for you to browse. You may factor multiple groups' findings on the same *Pocket* into your proposed experiment if you so wish. Take your time coming to a consensus on which *Pocket* your group wants to analyze. If your class has more than three groups, it is a good idea to take the time to skim the reports you did not peer review to inform your choice.

B. Proposal Requirements

Once you have selected a *Pocket Exploration Report* to build upon, write your proposal. Your proposal must include the following sections:

1. Introduction

The hypothesis must be described in detail; what model of the *Pocket*'s matter did the first group develop? You may need to do some interpretation and distillation of the findings in their report. This section doubles as your "background" section, where you describe the existing body of knowledge underlying your work. Include a detailed and succinct description of the model of the *Pocket* proposed by the *Pocket Exploration Report(s)* you are referencing.

Relevant rubric items:

B1: Identify the phenomenon to be investigated

B1a: Tone: Talking to a scientifically literate audience that is unfamiliar with this experimental set-up

B1b: Framing: What is the scientific question motivating this investigation?

C1: Is able to identify the hypothesis to be tested.

2. Methods

You should aim to identify multiple "directions" for investigation of the *Pocket*, if possible, nominally by digging into different elements of the proposed model or by considering multiple potential experimental methods. Briefly describe each of those, select one (or multiple, only if feasible), and justify your choice. Expand upon your selection in this section:

- A description of the possibility(ies) for further exploration of the *Pocket*, building upon the model. In other words, what are the different experiments you could plausibly conduct to test the model?
- A choice of which avenue to explore in your *Pocket Analysis Grant* project:
 - What hypothesis is your group testing?
 - What experimental procedure will you use to test this hypothesis?
 - What new equipment (see Section III) will you request from *REMI* to facilitate this experiment? Justify your choice. How will your new equipment support your experimental design?
 - Assuming the hypothesis holds, what is the predicted outcome of your experiment? Be specific. What analysis method(s) will you use to obtain this outcome?
 - If your experiment produces results inconsistent with the hypothesis, what will that look like?

Evaluation of this section will incorporate satisfactory answers to the above questions as well as your proposal's adherence to a few rubric items you are familiar with:

B3: Decide what physical quantities are to be measured and identify independent and dependent variables

C2: Is able to design a reliable experiment that tests the hypothesis

C4: Is able to make a reasonable prediction based on a hypothesis

C4a: Assumptions explained

C4b: Prediction follows from hypothesis

C4c: Prediction based on procedure

3. Budget

In this section, list the equipment you are requesting from *REMI*. In the Methods section, make sure to describe in detail

how that equipment will enable your group to perform your experiment. You may request up to four (4) credits' worth of new and improved equipment.

Your proposal must be submitted by midnight on Monday, November 22, 2021.

III. REMI CATALOGUE

Reality Exploration Measurement Instrumentation (*REMI*) is a close partner of the NSF, and home to the world's leading experts on manifesting scientific equipment from our universe in the *Manifold*. The NSF's *Pocket Exploration Grants* come with a *REMI* equipment requisition, allowing the grantee to request development of new equipment for use in the *Manifold*.

REMI has a number of projects in the works, which can be completed and made available to your group through acceptance of a *Pocket Exploration Grant Proposal*. If you require equipment or functionality not described below, contact your NSF program manager to discuss a custom equipment requisition.

Each accepted *Pocket Exploration Grant Proposal* will be allocated 4 *REMI credits* to spend on upgrades prior to carrying out their experiment.

Force meter:

1 credit: Improve precision by 1 decimal place.

2 credits: Ability to lock rotation.

2 credits: Ability to "latch" to highest recorded value.

Measuring tape:

1 credit: Improve precision by 1 decimal place.

2 credits: Measuring tapes will "snap" to alignment with the principal X, Y, and Z axes of the workspace.

Manipulator:

1 credit: Add a velocity readout that gives the velocity with which the object you are holding is being moved.

2 credits: (*requires previous upgrade*) Unlock the option to specify the velocity with which an object is moved toward or away from you with the thumbstick.

Pause Physics:

2 credits: Pause physics after a predetermined amount of time.

Workspace Dimensions:

1 credit: Quintuple the width or depth of your *Pocket's* workspace.

IV. NEXT STEPS

Your proposal will be reviewed prior to your next lab period. If your program manager identifies significant flaws in your plan, you will be invited to address them at the beginning of the next lab prior to acquiring your new tools and proceeding with your experiment.